SANBORN HEAD

Received June 29, 2023
ARD Permitting & Environmental
Health Bureau

Ms. Barbara Dorfschmidt
New Hampshire Department of Environmental Services
Air Resources Division
29 Hazen Drive, P.O. Box 95
Concord, New Hampshire 03302

July 5, 2023
File No. 4924.01

Re: Temporary Air Permit Application
Granite State Landfill, LLC.
Dalton, New Hampshire

Dear Barbara:

Sanborn, Head & Associates, Inc. (Sanborn Head) prepared the enclosed Temporary Air Permit Application on behalf of our client, Granite State Landfill, LLC (GSL) for the proposed landfill in Dalton, New Hampshire.

Please call Heather Little at 802-391-8506 if you have any questions.

Sincerely,
SANBORN, HEAD & ASSOCIATES, INC.

Meghan E. Close
Engineer

Heather H. Little, P.G.
Project Director

MEC/HHL: mec

Encl. Temporary Air Permit Application

cc: Joe Gay, GSL (electronic copy)
Kevin Roy, GSL (electronic copy)
David Healy, NHDES ARD (electronic copy)

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SANBORN HEAD

Temporary Air Permit Application

GRANITE STATE LANDFILL, LLC.
Dalton, New Hampshire

Prepared for Granite State Landfill, LLC.
File No. 4924.01
July 2023

TABLE OF CONTENTS

1.0 INTRODUCTION

On behalf of our client, Granite State Landfill, LLC, Sanborn, Head & Associates, Inc. (Sanborn Head) prepared this Temporary Air Permit Application (Application) for the proposed Granite State Landfill (GSL) to be located in Dalton, New Hampshire.

The Granite State Landfill would be approximately 70.1 acres of a double-lined solid waste disposal facility located in Dalton, New Hampshire (Figure 1). The facility is planned to receive primarily mixed municipal solid waste (MSW) and construction and demolition (C&D) waste, along with Special Wastes and NHDES-Certified Waste Derived Products approved on a case-by-case basis (as defined by the Facility Operating Plan, to be submitted by GSL at a later date).

The GSL would be developed in one phase (Figure 2). The design capacity of the proposed GSL is 10.8 million cubic yards (8.26 million cubic meters) or approximately 7.45 million megagrams (Mg) which is greater than the New Source Performance Standards (NSPS) for Municipal Solid Waste (MSW) Landfills contained in 40 Code of Federal Regulations (CFR) Part 60, Subpart XXX design capacity thresholds of 2.5 million Mg and 2.5 million cubic meters. Therefore, GSL will be subject to Subpart XXX upon commencement of construction.

Landfill construction is scheduled to begin in 2025. Landfilling operations are anticipated to begin in 2028 and continue through the end of 2045 based on currently projected filling grades. In accordance with §60.762(b), after the first year of waste placement in the landfill, GSL will calculate the uncontrolled non-methane organic compound (NMOC) emission rate in accordance with §60.764 and annually thereafter until such time as the calculated uncontrolled NMOC emission rate is equal to or greater than 34 Mg per year. At that time, GSL may choose to calculate NMOC emissions using the next higher tier in §60.764 or comply with §60.762(b)(2).

2.0 APPLICATION DESCRIPTION

In New Hampshire, a Temporary Air Permit is required for specified categories of new or modified stationary sources of air pollutants prior to construction (Part Env-A 607 of the New Hampshire Code of Administrative Rules [Rules]). The landfill is subject to these requirements because:

- LFG generation estimates, at full buildout of the landfill, indicate that possible fugitive emissions of:
  - uncontrolled hazardous air pollutants (HAPs) may be greater than major source thresholds (Env-A 607.01(y));
  - uncontrolled volatile organic compounds (VOCs) may be greater than ten tons per year (tpy) (Env-A 607.01(g));
  - uncontrolled hydrogen sulfide (H_2S) may be greater than an H_2S ambient air limit in Env-A 1400 (See Section 6.0) (Env-A 607.01(t)); and
- GSL is subject to an NSPS, specifically Subpart XXX as previously described.

GSL intends to voluntarily install an LFG collection and control system (GCCS) simultaneously to or shortly after the commencement of waste placement. An air permit for GCCS LFG combustion device(s) will be applied for separately at a later date, as the GCCS and LFG combustion device(s) will be constructed after the expiration date of the Temporary Permit being applied for herein. As such, air pollution control equipment is not proposed at this time. GSL plans to install the GCCS no later than the date required by 40 CFR 60.762(b)(2)(ii) or the date by which emissions estimates demonstrate that a comprehensive GCCS is required in order to maintain:

- HAP emissions at less than major source thresholds (Env-A 607.01(y));
- VOC emissions at less than the major source threshold of 50 tpy; or
- Fugitive emissions of RTAPs at less than the mass emission rates necessary to demonstrate compliance with each of the relevant AALs in Env-A 1400 based on air dispersion modeling (see Section 5.0).

GSL requests that the Temporary Permit limit:

- HAP emissions to less than the major source thresholds (10 tpy for a single HAP, or 25 tpy for all HAPs combined);
- VOC emissions to less than the major source threshold of 50 tpy; and
- Fugitive emissions of RTAPs to less than the mass emission rates necessary to demonstrate compliance with each of the relevant AALs in Env-A 1400 based on air dispersion modeling (see Section 5.0).

GSL recognizes that 40 CFR §63.43(e), Maximum Achievable Control Technology (MACT), will apply and that a MACT determination will be required when compliance with the major source HAP emissions limits cannot be demonstrated based on modeled fugitive gas generation rates.

In accordance with Chapter Env-A 1700, *Permit Application Forms*, of the New Hampshire Code of Administrative Rules (NHCAR), the following information is included herein:

- Form ARD-1 in Appendix A; includes facility identification, location, and emission information; and
- Form ARD-3 in Appendix A; includes information related to fugitive emissions of landfill gas (LFG).

3.0 LANDFILL GAS GENERATION ESTIMATES

To predict potential LFG generation rates, Sanborn Head used the U.S. Environmental Protection Agency's (USEPA's) Landfill Gas Emissions Model, Version 3.03 (LandGEM) with projected waste acceptance data.

Landfill gas generation rates were estimated using projected waste acceptance rates, AP-42 defaults for methane generation potential (L_0=100 m^3/Mg) and methane generation rate constant (k=0.04 yr^{-1}) and a multiplier of 1.7 based on fitting North Country Environmental Services' AP-42 gas collection rate curve to actual measured LFG collection rates.

The LandGEM projections indicate a peak LFG generation rate of 4,860 scfm occurring in the year 2046. Tables in Appendix B include projected waste acceptance data used as input to the LandGEM model (Table B-1) and annual LFG generation rate estimates from LandGEM modeling (Table B-2).

4.0 AIR POLLUTANT EMISSIONS

The NHDES classifies air emission sources for various categories by source types and emission thresholds. At GSL, there will be three categories of emission sources as defined by the NHDES. These sources include air pollutant sources, insignificant sources, and exempt sources.

4.1 Air Pollutant Sources

The estimated potential fugitive landfill emissions in units of pound per hour (lb/hr) are shown in Table 1 with the mass emission limits proposed in Section 2.0. Regulated Toxic Air Pollutants (RTAP), NMOC, and VOC emission rates in units of lb/hr are based on the modeled peak LFG generation rate described above and the assumption that all the LFG is emitted fugitively.

The list of included RTAPs is based on USEPA's Compilation of Air Pollutant Emission Factors (AP-42), Section 2.4, Tables 2.4-1 and 2.4-2. With the exception of H_2S, the concentration of each RTAP is also based on those AP-42 tables. The H_2S concentration shown in Table 1 is 1,100 ppm, based on a conservative (high) estimate of Total Reduced Sulfur (TRS) concentration at the NCES Landfill (based on historic sampling results at that site). This conservative (high) concentration at NCES Landfill will be used as a proxy for the future conservative (high) concentration at GSL until a point in time that samples can be collected from gas collection header piping at the GSL.

The NMOC concentration shown in Table 1 is also based on AP-42 Section 2.4, Table 2.4-2 for sites with no or unknown co-disposal. The VOC concentration is estimated to be 39 percent of the NMOC concentration based on AP-42 Table 2.4-2 Note C, in the absence of measured site-specific data.

Sample calculations are provided in Appendix C.

4.2 Insignificant Sources

At this time, the insignificant emission sources at the site are unknown. Possible insignificant activities at the GSL facility that meet the criteria set forth in the New Hampshire Code of Administrative Rules, Section Env-609.04 may include:

- A standby/emergency generator;
- A space heater which may combust No. 2 fuel oil and/or waste oil; and
- A portable crusher, that is owned by a separate entity and only operates at GSL when required.

There are also likely to be various tanks located at the GSL facility including:

- Above ground storage tanks (ASTs) used to store waste oil and/or No. 2 fuel oil located in the maintenance garage;
- Mobile tanker trucks used to store diesel fuel to refuel landfill equipment;
- ASTs used to store motor oil, hydraulic oil, and/or kerosene located in or nearby the maintenance garage; and
- Leachate underground storage tanks (USTs) and ASTs.

4.3 Exempt Sources

There are also likely to be activities at GSL that are considered exempt activities under Env-A 609.03(c), which may include, but are not limited to:

- Office activities;
- Interior, exterior, and architectural maintenance activities on the buildings and grounds;
- Maintenance of landfill equipment and hauling company vehicles;
- The use of consumer products for maintenance and other activities; and
- The use of mobile or portable equipment, which may be owned by GSL or outside contractors, including: portable space heaters; portable generators; construction equipment; and mobile or portable equipment to mix, pump, grind, crush, and compact refuse and other materials.

5.0 AIR POLLUTANT DISPERSION MODELING

Air dispersion modeling is required to support this Application because GSL plans to use the compliance demonstration method specified in Env-A 1405.02 to determine compliance with the ambient air limits (AALs) for RTAPs which will be fugitively emitted from the landfill due to waste decomposition. An Air Dispersion Modeling Protocol is included in Appendix D.

The final Air Dispersion Modeling Report will include the mass emission rates necessary to demonstrate compliance with each of the AALs in Env-A 1400 for landfill gas constituents based on the list provided in AP-42 Chapter 2.4.

6.0 COMPLIANCE PLAN

GSL will evaluate compliance with the mass fugitive emission limits requested in Section 2.0 on an annual basis starting 4 years after the commencement of waste placement based on:

- With the exception of H_2S, default LFG constituent concentrations found in AP-42 Tables 2.4-1 and 2.4-2;

- For H_2S, the LFG concentration measured in samples collected using the procedure outlined in Section 6 of USEPA Method 25C approximately 4 years after the commencement of waste placement[1]; and
- LFG flow rates based on actual waste acceptance rates and modeled fugitive gas generation rates.

A pre-test protocol based on Section 6 of USEPA Method 25C including any proposed variations will be prepared by GSL and provided to NHDES for approval prior to any LFG sampling.[2]

GSL requests that this compliance plan be re-evaluated during the process of obtaining an air permit for an LFG combustion device, when GSL voluntarily installs a GCCS. An LFG combustion device with approximately 98% destruction efficiency may be sufficient to maintain HAPs, VOCs, and RTAPs below the thresholds in Section 2.0 and the compliance plan described above would therefore no longer be required.

NHDES Form ARD-1, in Appendix A, includes the signature of an authorized representative of GSL which signifies his certification of information accuracy contained within this Application.

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[1] For H_2S, GSL proposes that samples be collected bi-annually, with the average of the results for samples collected in a calendar year being used in the annual compliance demonstration.

[2] The references to USEPA Method 25C are intended to refer to the method by which sample probes are installed. The number of probes, number of samples from each probe, QA/QC procedures, and LFG sample laboratory analysis methods (for various constituents [including NMOCs, VOCs, and RTAPs]) will be included in the pre-test protocol and approved by NHDES beforehand.

Tables

TABLE 1
Proposed Fugitive LFG Emissions
Temporary Air Permit Application

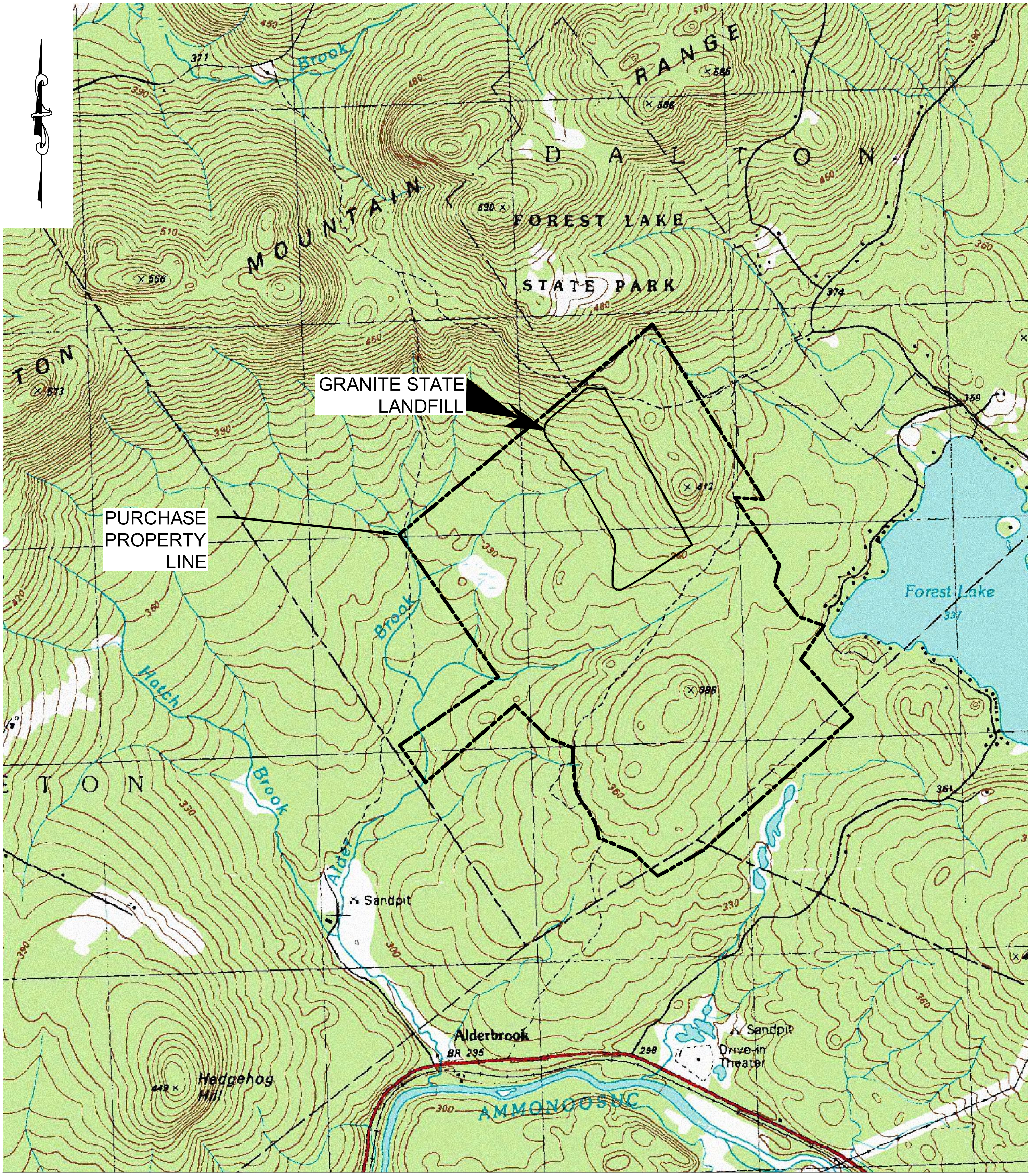
Granite State Landfill
Dalton, New Hampshire

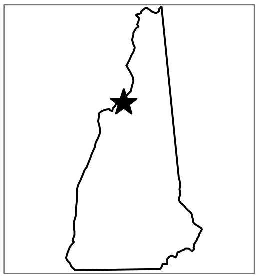
Approx. Landfill Gas Generation Rate (LandGEM)	4,860	cfm

CAS Number	Pollutant	Molecular Weight (g/mol)	Concentration in Landfill (ppm-v) (ppm-v)	Fugitive emissions (lbs/hr)	Fugitive emissions (tpy)
	NMOCs (as hexane)	86.2	595	38	167
	VOCs (as hexane)	86.2	235	15	50 (proposed)
CAS Number	**Hazardous Air Pollutants (HAPs) and Regulated Toxic Air Pollutants (RTAPs):**				
71-55-6	1,1,1-Trichloroethane	133.41	0.48	0.05	10 tpy (each) or less, if required to demonstrate compliance with Env-A 1400
79-34-5	1,1,2,2-Tetrachloroethane	167.85	1.11	0.1	
75-34-3	1,1-Dichloroethane	98.97	2.35	0.2	
75-35-4	1,1-Dichloroethene	96.94	0.20	0.01	
107-06-2	1,2-Dichloroethane	98.96	0.41	0.03	
78-87-5	1,2-Dichloropropane	112.99	0.18	0.02	
107-13-1	Acrylonitrile	53.06	6.33	0.3	
71-43-2	Benzene	78.11	1.91	0.1	
75-15-0	Carbon disulfide	76.13	0.58	0.03	
56-23-5	Carbon tetrachloride	153.84	0.004	0.0005	
463-58-1	Carbonyl sulfide	60.07	0.49	0.02	
108-90-7	Chlorobenzene	112.56	0.25	0.02	
75-00-3	Chloroethane	64.52	1.25	0.1	
67-66-3	Chloroform	119.39	0.03	0.003	
95-50-1	1,4 Dichlorobenzene	147.00	0.21	0.02	
75-09-2	Dichloromethane	84.94	14.3	0.9	
100-41-4	Ethylbenzene	106.16	4.61	0.4	
110-54-3	n-Hexane	86.18	6.57	0.4	
	Chlorinated Compounds emited as Hydrogen chloride	N/A		0.0	
7439-97-6	Mercury	200.61	0.000292	0.00004	
78-93-3	Methyl ethyl ketone	72.11	7.09	0.4	
108-10-1	Methyl isobutyl ketone	100.16	1.87	0.1	
127-18-4	Perchloroethylene	165.83	3.73	0.5	
108-88-3	Toluene	92.13	39.3	2.7	
79-01-6	Trichloroethylene	131.4	2.82	0.3	
75-01-4	Vinyl chloride	62.5	7.34	0.3	
1330-20-7	Xylenes	106.16	12.1	1.0	
	Total HAPs Proposed Limit = 25 tpy				
	Other Regulated Toxic Air Pollutants (RTAPs):				
156-60-5	t-1,2-dichloroethene (trans-1,2-Dichloroethylene)	96.94	2.84	0.2	TBD, based on demonstration of compliance with Env-A 1400
67-64-1	Acetone	58.08	7.01	0.3	
75-45-6	Chlorodifluoromethane	86.47	1.3	0.1	
74-87-3	Chloromethane	50.49	1.21	0.0	
75-43-4	Dichlorofluoromethane	102.92	2.62	0.2	
624-92-0	Dimethyl Sulfide	62.13	7.820	0.4	
64-17-5	Ethanol	46.08	27.2	0.9	
106-93-4	Ethylene dibromide	187.88	0.001	0.0001	
75-08-1	Ethyl mercaptan	62.13	2.28	0.1	
7783-06-4	Hydrogen sulfide	34.08	1,100	27.9	
74-93-1	Methyl mercaptan	48.11	2.49	0.1	
67-63-0	2-Propanol	60.11	50.1	2.2	

Notes:
1. RTAPs listed in the US EPA's Compilation of Pollutant Emission Factors (AP-42), Section 2.4, MSW Landfills (dated 11/98), Table 2.4-1 and Table 2.4-2, have been included in emissions estimate. Benzene and toluene data is listed in AP-42 Table 2.4-2. With the exception of hydrogen sulfide (H_2S), the concentration of each RTAP is also based on those AP-42 tables.
2. The NMOC concentration is based on AP-42 Section 2.4, Table 2.4-2 based on sites with no or unknown co-disposal.
3. The VOC concentration is estimated to be 39% of NMOC concentration based on AP-42,Table 2.4-2 Note C, or 235 ppm in the absence of site specific NMOC data.
4. Fugitive emissions (lb/hr) are estimated based on the maximum volume of LFG anticipated to be emitted from the landfill surface at full buildout, 4,860 scfm.
5. The hydrogen sulfide concentration of 1,100 ppm is based on a conservative (high) estimate of Total Reduced Sulfur (TRS) concentration at NCES Landfill based on historic sampling results. This conservative (high) concentration at NCES Landfill will be used as a proxy for the future conservative (high) concentration at GSL until a point in time that samples can be collected from gas collection header piping at the GSL.

Figures





Note:

Base Map USGS 7.5 minute topoquad Bethlehem W, New Hampshire dated 1998.

Drawn By: E. Wright
Designed By: M. Close
Reviewed By: H. Little
Project No: 4924.01
Date: May 2023

Feet
1,000' 0 2,000'

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Figure 1

Locus Plan

Temporary Air Permit Application

Granite State Landfill, LLC
Dalton, New Hampshire

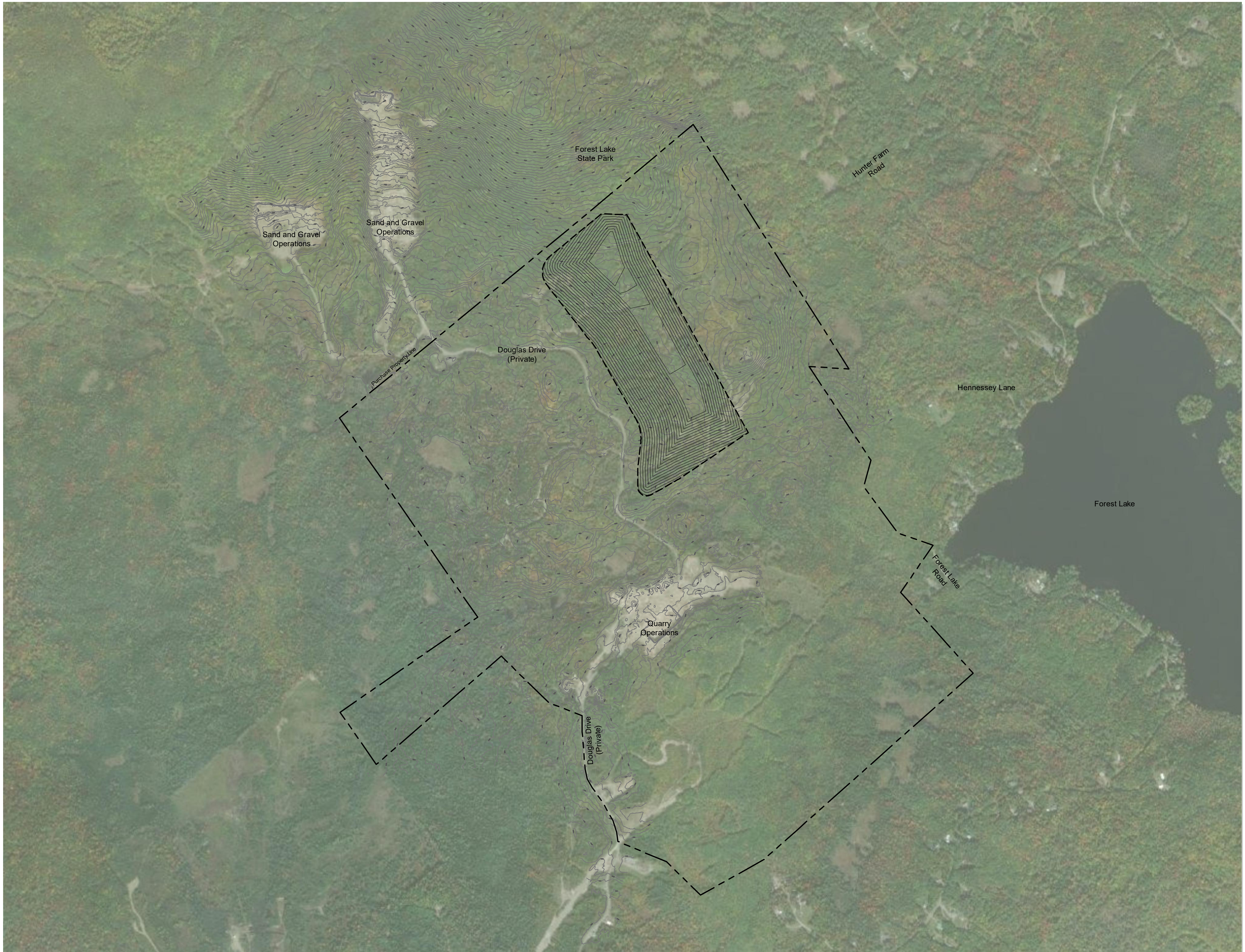


Figure 2

Site Plan

Temporary Air Permit Application

Granite State Landfill LLC
Dalton, New Hampshire

Drawn By: E. Wright
Designed By: M. Close
Reviewed By: H. Little
Project No: 4924.01
Date: May 2023

Figure Narrative

This figure shows the approximate location of existing and proposed features in the vicinity of the site.

Notes

1. Ground surface topography provided by Horizons in January 2023.

2. Purchase property line provided by CMA in March 2023.

3. Proposed top of waste grades provided by CMA in March 2023.

Legend

- - - - Purchase property line

—— Ground surface topography

—— Proposed 10 foot contour

- - - - Proposed limit of waste

N W E S

500' 250' 0 500' 1,000' Feet

SANBORN HEAD

File:P:\4900s\4924.01\Graphics Files\CAD\Air Modeling\AirMod_SitePlan.dwg Plot Date: 5-23-23

Appendix A

NHDES ARD Application Forms

Received July 5, 2023
ARD Permitting & Environmental
Health Bureau

ARD-1 FORM
GENERAL FACILITY INFORMATION

Air Resources Division/Permitting and Environmental Health Bureau

RSA/Rule: RSA 125-C:12 and Env-A 1700

This ARD-1 General Facility Information form shall be submitted with every application for an air permit, except for a Permit by Notification (PBN).

1. TYPE OF FACILITY[1]			
☒ Title V	☐ Non-Title V	☐ Unknown	
2. TYPE OF PERMIT[2]			
☒ Temporary Permit (Construction)	☐ State Permit to Operate	☐ Title V Operating Permit	
☐ General State Permit	☐ Limitation on Potential to Emit (Env-A 625)		
3. TYPE OF APPLICATION[3]			
☒ New	☐ Renewal	☐ Modification	☐ Administrative Amendment
4. FACILITY INFORMATION			
FACILITY NAME[4]: Granite State Landfill	AFS NUMBER[5]:		
PHYSICAL ADDRESS: 104 Douglas Drive			
TOWN/CITY: Dalton	STATE: NH	ZIP: 03598	
GOVERNMENT FACILITY CODE[6]: 0			
5. BUSINESS INFORMATION AS REGISTERED WITH SECRETARY OF STATE (If applicable)			
REGISTERED NAME: Granite State Landfill, LLC			
REGISTERED ADDRESS: 581 Trudeau Road			
TOWN/CITY: Bethlehem	STATE: NH	ZIP: 03574	
6. PARENT CORPORATION INFORMATION (If applicable)			
PARENT CORPORATION NAME: New England Waste Services, Inc. (a wholly owned subsidiary of Casella Waste Systems, Inc.)			
MAILING ADDRESS: 25 Greens Hill Lane			
TOWN/CITY: Rutland	STATE: Vermont	ZIP: 05701	

7. MAJOR ACTIVITY OR PRODUCT DESCRIPTION
List all activities performed at this facility and provide SIC and/or NAICS Code(s).

SIC Code	Activity Description	NAICS Code	Activity Description
4953	Municipal Solid Waste Landfill	562212	Municipal Solid Waste Landfill

At a minimum, please provide contact information below for Responsible Official, Prepared Application, Technical, and Invoicing contacts. Make as many copies of this page as necessary in order to include all contacts that you wish to associate with the application. Multiple people can be assigned one role; multiple roles can be assigned to one person.

8. RESPONSIBLE OFFICIAL INFORMATION		
RESPONSIBLE OFFICIAL NAME[7]: John Gay		
TITLE: Engineer		
COMPANY NAME: Granite State Landfill, LLC		
MAILING ADDRESS: 1855 Route 100		
TOWN/CITY: Hyde Park	STATE: VT	ZIP: 05655
EMAIL ADDRESS: John.Gay@casella.com		
TELEPHONE NUMBER: 802-651-5454	EXTENSION:	
FAX NUMBER: N/A		
ROLES: ☒ Responsible Official ☒ Technical ☒ Invoicing ☐ Legal ☐ Emissions ☐ Prepared Application ☒ Corporate ☐ Owner/Operator ☐ Consultant		

9. ADDITIONAL CONTACT INFORMATION		
CONTACT NAME: Heather Little, P.G.		
TITLE: Project Director		
COMPANY NAME: Sanborn, Head & Associates, inc.		
MAILING ADDRESS: 187 St. Paul Street, Suite 201		
TOWN/CITY: Burlington	STATE: VT	ZIP: 05401
EMAIL ADDRESS: hlittle@sanbornhead.com		
TELEPHONE NUMBER: 802-391-8506	EXTENSION:	
FAX NUMBER: N/A		
ROLES: ☐ Responsible Official ☒ Technical ☐ Invoicing ☐ Legal ☒ Emissions ☒ Prepared Application ☐ Corporate ☐ Owner/Operator ☒ Consultant		

10. ADDITIONAL CONTACT INFORMATION		
CONTACT NAME: Kevin Roy		
TITLE: Division Manager		
COMPANY NAME: Granite State Landfill, LLC		
MAILING ADDRESS: 581 Trudeau Road		
TOWN/CITY: Bethlehem	STATE: NH	ZIP: 03574
EMAIL ADDRESS: Kevin.Roy@casella.com		
TELEPHONE NUMBER: 603-869-3366	EXTENSION:	
FAX NUMBER: N/A		

ROLES:	☐ Responsible Official	☒ Technical	☒ Invoicing	☒ Legal	☒ Emissions
	☐ Prepared Application	☒ Corporate	☐ Owner/Operator	☐ Consultant	

11. ADDITIONAL CONTACT INFORMATION		
CONTACT NAME:		
TITLE:		
COMPANY NAME:		
MAILING ADDRESS:		
TOWN/CITY:	STATE:	ZIP:
EMAIL ADDRESS:		
TELEPHONE NUMBER:	EXTENSION:	
FAX NUMBER:		

ROLES:	☐ Responsible Official	☐ Technical	☐ Invoicing	☐ Legal	☐ Emissions
	☐ Prepared Application	☐ Corporate	☐ Owner/Operator	☐ Consultant	

12. ADDITIONAL CONTACT INFORMATION		
CONTACT NAME:		
TITLE:		
COMPANY NAME:		
MAILING ADDRESS:		
TOWN/CITY:	STATE:	ZIP:
EMAIL ADDRESS:		
TELEPHONE NUMBER:	EXTENSION:	
FAX NUMBER:		

ROLES:	☐ Responsible Official	☐ Technical	☐ Invoicing	☐ Legal	☐ Emissions
	☐ Prepared Application	☐ Corporate	☐ Owner/Operator	☐ Consultant	

13. ADDITIONAL CONTACT INFORMATION		
CONTACT NAME:		
TITLE:		
COMPANY NAME:		
MAILING ADDRESS:		
TOWN/CITY:	STATE:	ZIP:
EMAIL ADDRESS:		
TELEPHONE NUMBER:	EXTENSION:	
FAX NUMBER:		

ROLES:	☐ Responsible Official	☐ Technical	☐ Invoicing	☐ Legal	☐ Emissions
	☐ Prepared Application	☐ Corporate	☐ Owner/Operator	☐ Consultant	

For ALL APPLICATIONS except Administrative Amendments, General State Permits, and Limitations on Potential to Emit:

14. FACILITY-WIDE EMISSIONS		
POLLUTANT[8]	POTENTIAL TPY	ACTUAL TPY
See Table 1, attached.	See Table 1, attached.	Not applicable, source is not yet constructed.

Please include calculations used in determining emissions and include any non-permitted emission devices.

15. FOR NEW APPLICATIONS OR IF CHANGES ARE MADE – PLEASE INCLUDE:	
☒	A copy of the USGS map, property identified, which shows the facility's location.
☒	A site plan to scale of the facility showing: 1. The locations of all emission points; 2. The dimensions of all buildings and tiers, including roof heights; and 3. The facility's property boundary and any security features (fences, walls, etc.).

16. FOR TITLE V PERMIT APPLICATIONS – PLEASE INCLUDE:[9]		
Included in Application	**Previously Submitted and Unchanged**	
☐	☐	A. Identification and details of limitations on source operation, or any work practice standards affecting emissions for all regulated pollutants.
☐	☐	B. Information required by any other applicable requirement of the Act, including, but not limited to, information related to stack height limitations developed pursuant to section 123 of the federal Clean Air Act (42 U.S.C. §7401).
☐	☐	C. A citation and description of state and federal air pollution control regulations and requirements applicable to each emission unit.
☐	☐	D. A narrative description or reference to test methods used or required for initial compliance demonstration with each applicable regulation.
☐	☐	E. Any additional information required to be provided pursuant to the Act or to determine applicability of any other requirements of the Act.
☐	☐	F. A written explanation of proposed exemptions.
☐	☐	G. Any information required to be provided to the director pursuant to the Act in order to evaluate alternative operating scenarios, or to define permit terms and conditions.

☐	☐	H. A list of all equipment and devices located at the source classified as insignificant activities pursuant to Env-A 600, including appropriate sizing data for equipment and devices which are exempt from permitting requirements based on their process ratings, fuel consumption rate, or both.

16. CONTINUED - FOR TITLE V PERMIT APPLICATIONS – PLEASE INCLUDE:[10]

Included in Application	
☐	I. Compliance plan information containing: 1. A narrative description of the compliance status of the source with respect to all applicable requirements; 2. A narrative statement of methods used to determine continued compliance, including a description of monitoring, recordkeeping and reporting requirements and test methods; 3. A statement indicating the source's compliance status with an applicable enhanced monitoring and compliance certification requirements specified in Env-A 800; 4. A statement that the source shall continue to comply with all applicable requirements; 5. A statement that the source shall meet all applicable requirements that will become effective during the permit term on a timely basis; 6. A compliance schedule stating all applicable requirements with which the source is not in compliance, consistent with the following: a. The compliance schedule shall incorporate the requirements of and be at least as stringent as that contained in any judicial consent decree or administrative order to which the source is subject; b. Such compliance schedule shall be supplemental to, and not sanction non-compliance with, the applicable requirements on which it is based; and c. The compliance schedule shall include the following statements and schedules: i. A narrative description of how the source shall achieve compliance with such requirements; ii. A schedule of remedial measures, including an enforceable sequence of actions with milestones leading to compliance with any applicable requirements for which the source shall be in non-compliance with at the time of permit issuance; and iii. A schedule for submission of certified progress reports no less frequently than every 6 months. 7. For sources deemed in compliance with all applicable requirements, a certified statement signed by a responsible official stating: "The undersigned certifies that, based on information and belief formed after reasonable inquiry, the source is in compliance with all applicable regulations"; and 8. A schedule for submission of compliance certifications during the permit term, to be submitted annually or more frequently as specified by the underlying applicable requirement.
☐	J. For sources subject to Title IV of the Act, the compliance plan requirements, specified in (I.) above, shall apply to and be included in the acid rain portion of a compliance plan for an affected source, except as specifically superseded by regulations promulgated under Title IV of the Act with regard to the schedule and method(s) the source will use to achieve compliance with the acid rain emission limitations.
☐	K. In addition to the forms required pursuant to Env-A 1700, sources subject to Title IV of the Act shall use the nationally standardized forms for the acid rain portions of the Title V operating permit application, pursuant to 40 CFR 72.30.

This section of the form must be completed and signed by the Responsible Official only.

17. CERTIFICATIONS	
☐	I certify that the applicant, or the owner or operator the applicant represents, has right, title, or interest in all of the property that is proposed for development or use because the owner or operator owns, leases, or has binding options to purchase all of the property proposed for development or use. I am authorized to make this submission on behalf of the affected source or affected units for which this submission is made. I certify under penalty of law that I have personally examined, and am familiar with, the information submitted in this document and all of its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false statements and information or omitting required statements and information, including the possibility of fine or imprisonment.

18. RESPONSIBLE OFFICIAL INFORMATION AND SIGNATURE	
RESPONSIBLE OFFICIAL NAME: John Gay	
TITLE: Engineer	
RESPONSIBLE OFFICIAL'S SIGNATURE J. Gay	DATE: 6/28/23

ARD-1 GENERAL FACILITY INFORMATION INSTRUCTIONS

1 A list of Title V facilities in NH can be found to the NHDES website. Most facilities are Non-Title V. Check Unknown if you are unsure.

2 Temporary Permit = New Construction at Existing or New Facility
State Permit to Operate = Existing Non-Title V Facilities
Title V Operating Permit = Existing Title V Facilities
GSP = General State Permit
Limitation on Potential to Emit = Small Facilities requesting coverage under Env-A 625

3 New = New devices at facility, change in operation at Existing facility or New facility never permitted before
Renewal = Renewal of any permit type
Modification = Currently permitted by non-expired permit and wants to make amendment/modification to information contained in permit. This includes adding/removing devices covered by GSP.
Administrative Amendment = changes in ownership or responsible official.

4 Facility Name = Trade Name or Doing Business As

5 AFS number is assigned by NHDES and is a 10-digit number starting with 33 (example 3300100001).

6 0 = Facility is not government owned
1 = Source owned by the Federal Government
2 = Source owned by the State
3 = Source owned by the County
4 = Source owned by the Municipality
5 = Source owned by the District

7 Responsible Official:
For a corporation = President, Secretary, treasurer, or vice-president in charge of a principal business function
For a partnership = General partner or proprietor
For a municipality = Principal executive officer or ranking elected official

8 For Title V sources, include facility wide emissions of filterable PM, filterable PM_{10}, filterable $PM_{2.5}$, condensable PM, SO_2, NO_x, CO, NMVOCs, Pb (if appropriate), HAPs, and CO_2e.

9 If any of the information requested in Section 16 A-H was submitted in a previous Title V Operating Permit application and has **not** changed, it can be incorporated by reference in the renewal application package. This previous information must be clearly referenced in the renewal application package and must accurately reflect current operations at the facility. If any changes have occurred at the facility or if changes are proposed in the renewal application package, new information must be provided. The information requested in Section 16 I-K must be completed based on current operations at the facility. Due to the time sensitive nature of this required information, incorporation by reference in the application package is **not** allowed.

ARD-3-FORM
INFORMATION REQUIRED FOR PERMITS FOR A UNIT OF PROCESSING OR MANUFACTURING EQUIPMENT

¶

Air Resources Division/Permitting and Environmental Health Bureau

RSA/Rule: RSA 125-C:12 and Env-A 1700

I. EQUIPMENT INFORMATION – *Complete a separate form for each Emission Unit.*

Emission Unit Description: GSL Landfill

Process/ Device	Manufacturer Model # Serial #	Maximum Raw Material Process Rate	Maximum Finished Material Process Rate	Manufacture Date[1]	Installation Date[1]	Stack #	Hours of Operation per day and days/yr
Paint Booth #3 (Example)	*N/A (Example)*	*8 gal/hr (Example)*	*N/A (Example)*	*1997 (Example)*	*1999 (Example)*	*#1 (Ex)*	*3 hr/day; 250 days/yr (Example)*
Metal Furnace #2 (Example)	*Consumat Model C12 S/N: 2569 (Example)*	*N/A (Example)*	*500 lbs/hr (Example)*	*2002 (Example)*	*2002 (Example)*	*#5 (Ex)*	*9 hr/day; 300 days/yr (Example)*
Landfill	N/A	N/A	N/A	2025 Commencement of construction)	2028 (Commencement of LF Operations)	N/A	N/A

Process Description - Please provide a brief description of each process performed (attach additional pages as needed):

The Granite State Landfill (GSL) would be approximately 70.1 acres of a double-lined solid waste disposal facility in Dalton, New Hampshire (Figure 1). The facility is planned to receive primarily mixed municipal solid waste (MSW) and construction and demolition (C&D) waste, along with Special Wastes and NHDES-Certified Waste Derived Products. Construction is scheduled to begin in 2025.

A. Parts Washers/Solvent Degreasers

☒ **Not Applicable**

Process/Device	Manufacturer & Model #	Capacity (gal)	Solvent Used	# Solvent Changes per Year
Degreaser #2 (Example)	*Safety-Kleen Model 16 (Example)*	*16 gal (Example)*	*Recycled 150 Solvent (Example)*	*2 (Example)*

B. Coatings, Solvents, and Inks Entering Process – *Use additional sheets if necessary*

☒ **Not Applicable**

Process/ Device	Raw Material or Chemical Compound	Potential Usage (gal or lb per hour and per year)		Density (lb/gal)	Percent VOC[2] (wt %)	Percent HAP[3] (wt %)	Potential VOC emissions (lb/yr)	Potential HAP emissions (lb/yr)
Paint Booth (Example)	*Black Enamel #5693 (Example)*	*13 gal/hr (Example)*	*1360 gal/yr (Example)*	*7.5 lb/gal (Example)*	*67.96% (Example)*	*13.17% (Example)*	*6,932 lb/yr (Example)*	*1,343 lb/yr (Example)*

Provide an example of the calculations used to determine total potential VOC and HAP emitted. Indicate if the results are based on test results; if control equipment was taken into account; if conditions exist where solvents remain in the substrate rather than complete volatilization, transfer efficiency, etc.:

Coating Application Method:

- ☐ High Volume-Low Pressure (HVLP) Spray
- ☐ Air-Assisted Airless Spray
- ☐ A Flow Coating Technique
- ☐ Electrostatic Spray
- ☐ Airless Spray
- ☐ Other (specify): ______________________
- ☐ Zinc-Arc Spray
- ☐ Dip Coat

C. Amount of Liquid Waste Discarded:

Not Applicable ☐ gal/yr ☐ tons/yr

D. Stack Information

Is device equipped with multiple stacks? ☐ Yes ☐ No *(If yes, provide data for each stack)*
Are multiple units connected to this stack? ☐ Yes ☐ No
*(If **yes**, identify other devices on this stack:)*

Stack #	Discharge Height Above Ground Level (ft)	Inside Diameter (ft) or Area (ft^2) at Stack Exit[4]	Exhaust Temperature (°F)	Exhaust Flow (acfm)	Stack Capped or Otherwise Restricted[5] (Yes - Type/No)	Exhaust Orientation[6]	Stack Monitor (Yes/No) and Description
#5 (Ex)	*65 ft (Example)*	*4 ft (Example)*	*70 °F (Example)*	*1500 acfm (Example)*	*Yes - Rain Cap (Example)*	*Vertical (Example)*	*No (Example)*
Not Applicable							

E. Hours of Operation

Hours per day: 24 Days per year: 365

II. NEW HAMPSHIRE REGULATED TOXIC AIR POLLUTANTS (RTAPs) – Env-A 1400

Do any of the devices or processes emit any of the RTAPs listed in Env-A 1400?
☒ Yes ☐ No

If **Yes**, attach your facility's most recent compliance demonstration.

An Air Dispersion Modeling Protocol is attached to this Temporary Air Permit Application. Upon approval of the Protocol by the NHDES, an Air Dispersion Modeling Report will be provided to NHDES.

III. SUPPLEMENTAL FUEL USAGE INFORMATION

☒ Not Applicable

A. Fuel Information (List each fuel utilized by the devices)

Device	Fuel Type	Heat Value[7]	Units	Sulfur Content (%)	Maximum Fuel Flow Rate	Units	Maximum Gross Heat Input Rate	Units
Thermal Oxidizer (Example)	*#2 Fuel Oil (Example)*	*140,000 (Example)*	*Btu/gal (Example)*	*0.0015 (Example)*	*20 (Example)*	*gal/hr (Example)*	*1.2 (Example)*	*MMBtu/hr (Example)*

B. Air Pollutant Emissions from Combustion

Pollutant	Emission Factor	Units	Emission Factor Source[8]	Actual (lb/hr)	Potential (lb/hr)	Actual (tpy)	Potential (tpy)
TSP							
PM_{10}							
NO_x							
VOC							
CO							
SO_2							
Other *(specify)*							
Provide an example of the calculations used to determine uncontrolled air pollutant emissions, if applicable:							

Note: If process utilizes more than one Supplemental Fuel Burning Device, provide all six pollutant emissions information for each device. Use additional pages if necessary.

IV. POLLUTION CONTROL EQUIPMENT

☒ **Not Applicable**

Note: If the devices utilize more than one type of pollution control equipment, provide data for each type of equipment.

Device	Type of Control Device	Manufacturer of Control Device	Model and Serial Number of Control Device (if known)	Pollutant(s) Controlled by Device
Metal Furnace #2 (Example)	*Baghouse #2 (Example)*	*Ultra-Flow Inc. (Example)*	*2400 CFM Small Dust Collector Serial #: N/A (Example)*	*TSP (Example)*
Paint Spray Booth (Example)	*Filter (Example)*	*Paint Arrestors (Example)*	*3100 Series (Example)*	*Zinc Chromate (Example)*

For each control device, include an Air Pollution Control Equipment Monitoring Plan pursuant to Env-A 810.

A. Controlled Air Pollution Emissions (list emissions that result after all add on controls – *use additional sheets if necessary*)

Pollutant	Controlled Emission Factor	Units	Emission Factor Source[9]	Actual (lb/hr)	Potential (lb/hr)	Actual (tpy)	Potential (tpy)

Provide an example of the calculations used to determine controlled air pollutant emissions, if applicable:

ARD-3 FORM INFORMATION INSTRUCTIONS

1 If exact date is unknown for Manufacture Date or Installation Date, you may use 01/01/year. Manufacture Date refers to the date the emission unit was originally produced. Installation Date refers to the date the emission unit is installed at the facility.

2 Volatile Organic Compound, as defined in Env-A 100.

3 Hazardous Air Pollutant, as defined in section 112 of the 1990 Clean Air Act Amendments.

4 Examples of Inside Diameter or Area at Stack Exit: Diameter at discharge point of convergence cone, if applicable

5 Flapper valves and other devices which do not restrict the vertical exhaust flow while the device is operating are not considered obstructions or restrictions.

6 Examples of Exhaust Orientation: Vertical, Horizontal, Downward
Note: for a stack to be considered vertical and unobstructed, there shall be no impediment to vertical flow, and the exhaust stack extends 2 feet higher than any roofline within 10 horizontal feet of the exhaust stack

7

Liquid Fuels	Heat Value
Ultra-Low Sulfur Diesel (ULSD)	137,000 Btu/gal
#2 Fuel Oil	140,000 Btu/gal
Kerosene	135,000 Btu/gal
Other – Liquid	Obtain from Fuel Supplier

Gaseous Fuels	Heat Value
Natural Gas	1,020 Btu/cubic foot
Propane (LPG)	94,000 Btu/gal
Gasoline	130,000 Btu/gal
Other (Gaseous)	Obtain from Fuel Supplier

8 Emission factor sources may include:
- Continuous Emissions Monitor (CEM)
- Stack Test (Provide Date)
- Vendor Guaranteed Rates (Provide Documentation)
- AP-42 Emission Factors
- Material Balance (Provide Sample Calculation)
- Engineering Estimate

Appendix B

Landfill Gas Generation Rate Tables

Table B-1
Waste Acceptance Rates

Granite State Landfill
Dalton, New Hampshire

Year	Total	
	Waste Acceptance Rate (Mg)	Waste Acceptance Rate (tons)
2028	413,676	456,000
2029	413,676	456,000
2030	413,676	456,000
2031	413,676	456,000
2032	413,676	456,000
2033	413,676	456,000
2034	413,676	456,000
2035	413,676	456,000
2036	413,676	456,000
2037	413,676	456,000
2038	413,676	456,000
2039	413,676	456,000
2040	413,676	456,000
2041	413,676	456,000
2042	413,676	456,000
2043	413,676	456,000
2044	413,676	456,000
2045	413,676	456,000
Total	**7,446,174**	**8,208,000**

Notes:
1. Megagrams (Mg) = tons x 0.907185
2. The projected annual waste acceptance rate for 2028 through 2045 is based on the GSL capacity of 10.8 x 10^6 cubic yards (cy), and a compaction density of 1,520 lb/cy, rounded to 0.76 tons/cy, to convert waste volume to mass. Information was provided by CMA Engineers on March 20, 2023.
3. The projected filling rate of 600,000 cubic yards (456,000 tons/year) was provided by CMA Engineers on March 20, 2023.

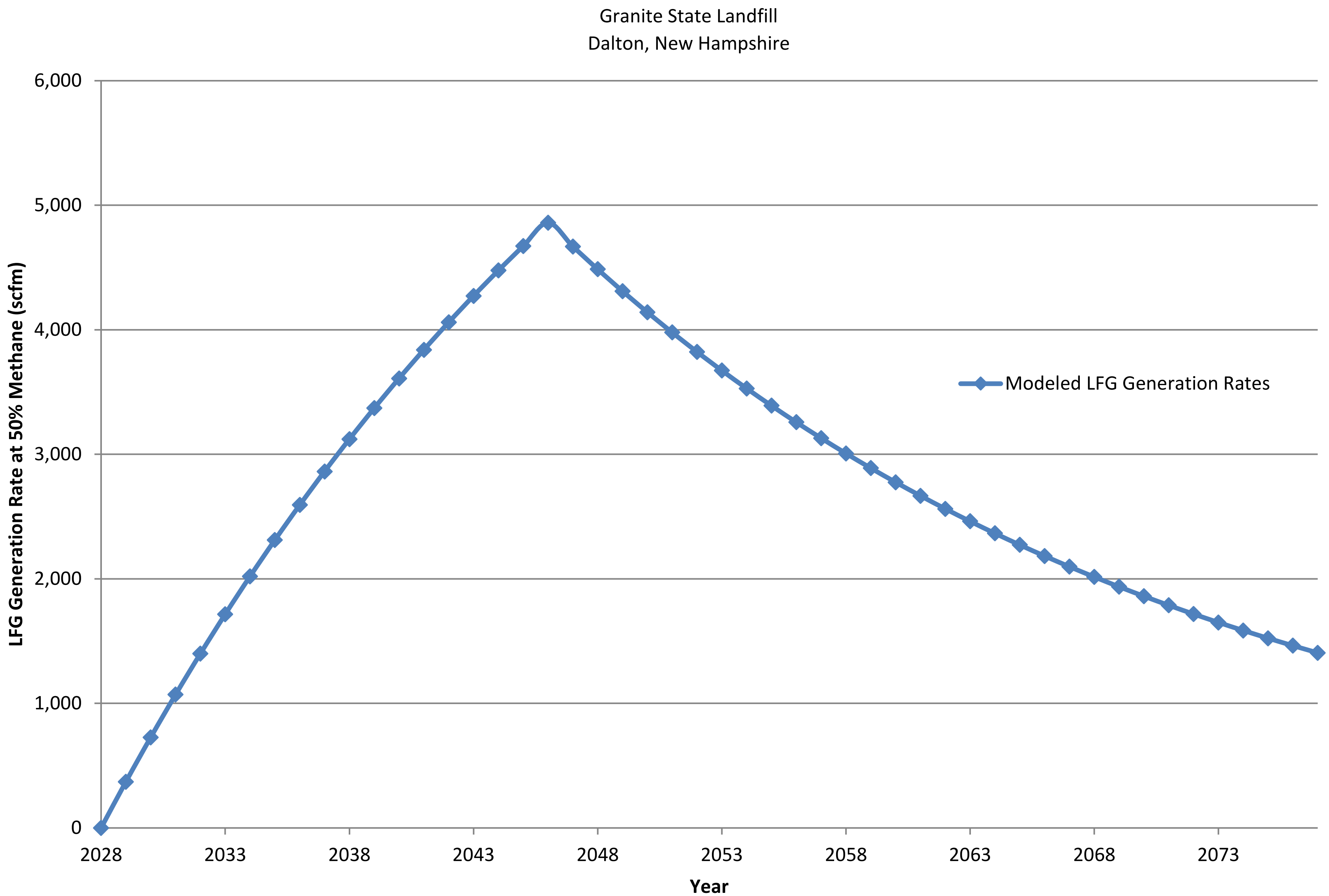
Table B-2
Landfill Gas Generation Rate Estimates from LandGEM Modeling

Granite State Landfill
Dalton, New Hampshire

	LandGEM Modeling with Lo=100 m^3/Mg, k=0.04/yr	
Year	Modeled LFG *Generation* Rate (scfm)	Modeled LFG *Generation* Rate x 1.7 multiplier (scfm)
2028	0	0
2029	218	371
2030	428	728
2031	630	1,071
2032	824	1,400
2033	1,010	1,716
2034	1,189	2,020
2035	1,360	2,313
2036	1,525	2,593
2037	1,684	2,863
2038	1,836	3,122
2039	1,983	3,371
2040	2,123	3,610
2041	2,259	3,840
2042	2,388	4,060
2043	2,513	4,272
2044	2,633	4,476
2045	2,748	4,672
2046	2,859	4,860
2047	2,747	4,669
2048	2,639	4,486
2049	2,536	4,310
2050	2,436	4,141
2051	2,341	3,979
2052	2,249	3,823
2053	2,161	3,673
2054	2,076	3,529
2055	1,995	3,391
2056	1,916	3,258
2057	1,841	3,130
2058	1,769	3,007
2059	1,700	2,889
2060	1,633	2,776
2061	1,569	2,667
2062	1,507	2,563
2063	1,448	2,462
2064	1,392	2,366
2065	1,337	2,273
2066	1,285	2,184
2067	1,234	2,098
2068	1,186	2,016
2069	1,139	1,937
2070	1,095	1,861
2071	1,052	1,788
2072	1,010	1,718
2073	971	1,650
2074	933	1,586
2075	896	1,524
2076	861	1,464
2077	827	1,406

Notes:
1. Landfill gas (LFG) generation rates were estimated with the USEPA's "Landfill Gas Emissions Model (LandGEM), Version 3.03," using projected waste acceptance rates, AP-42 defaults for methane generation potential (L_O=100 m^3/Mg) and methane generation rate constant (k=0.04 yr^{-1}) and a multiplier of 1.7 based on fitting NCES' AP-42 gas collection rate curve to actual measured LFG collection rates.

Figure B-1
Granite State Landfill Gas Generation Rate Modeling Results



Notes:

1. Landfill gas (LFG) generation rates were estimated with the USEPA's "Landfill Gas Emissions Model (LandGEM), Version 3.03," using projected waste acceptance rates and AP-42 defaults for methane generation potential (L_O=100 m^3/Mg) and methane generation rate constant (k=0.04 yr^{-1}) and a multiplier of 1.7 (based on fitting North Country Environmental Services' AP-42 gas collection rate curve to actual measured LFG collection rates).

Appendix C

Sample Calculations

PURPOSE:

The purpose of these sample calculations is to present the methods used to estimate fugitive emission rates for the Granite State Landfill (GSL).

GIVEN:

- Molar Volume = 24.45 liter/mol at standard conditions (298 °K, 760 mmHg)
- Predicted landfill gas (LFG) generation rate from GSL = 4,860 scfm

CALCULATION:

Fugitive NMOCs, VOCs, and RTAP Emissions

Non methane organic compounds (NMOCs), volatile organic compounds (VOCs), and regulated toxic air pollutant (RTAP) emissions are based on concentrations of compounds in LFG.

A list of LFG constituents and respective concentrations is found in US EPA AP-42 Compilation of Air Emissions Factors. Hexane is used as an example.

- Concentration of Hexane found in LFG = 6.57 ppmv, AP-42
- Molecular weight of Hexane = 86.18 g/mol

Estimated Fugitive Hexane Emission Rate =

$$\frac{6.57\text{ mol Hexane}}{10^6\text{ mol LFG}} \times \frac{86.18\text{ g Hexane}}{\text{mol Hexane}} \times \frac{\text{lb Hexane}}{453.6\text{ g Hexane}} \times \frac{\text{mol LFG}}{24.45\text{ liter LFG}} \times \frac{28.317\text{ liter LFG}}{\text{scf LFG}} \times \frac{4{,}860\text{ scf}}{\text{min}} \times \frac{60\text{ min}}{\text{hr}} = \frac{0.422\text{ lb Hexane}}{\text{hr}}$$

$$\frac{0.422\text{ lb Hexane}}{\text{hr}} \times \frac{\text{ton}}{2{,}000\text{ lb}} \times \frac{8{,}760\text{ hr}}{\text{yr}} = \frac{1.846\text{ ton Hexane}}{\text{yr}}$$

Appendix D

Air Dispersion Modeling Protocol

SANBORN HEAD

Air Dispersion Modeling Protocol

GRANITE STATE LANDFILL, LLC
Dalton, New Hampshire

Prepared for Granite State Landfill, LLC
File No. 4924.01
July 2023

TABLE OF CONTENTS

1.0 INTRODUCTION

On behalf of our client, Granite State Landfill, LLC (GSL), Sanborn, Head & Associates, Inc. (Sanborn Head) prepared this Air Dispersion Modeling Protocol for the proposed Granite State Landfill in Dalton, New Hampshire (landfill). This protocol and the subsequent air dispersion modeling report are in support of a Temporary Permit Application (Application), which will be submitted to the New Hampshire Department of Environmental Services (NHDES) in June 2023.

In New Hampshire, a Temporary Air Permit is required for specified categories of new or modified stationary sources of air pollutants prior to construction (Part Env-A 607 of the New Hampshire Code of Administrative Rules [Rules]). The landfill is subject to these requirements.

Air dispersion modeling is required because GSL is using the compliance demonstration method specified in Env-A 1405.02 to determine compliance with the ambient air limits (AALs). Air dispersion modeling will be performed in general accordance with NHDES's Guidance and Procedure for Performing Air Quality Impact Modeling in New Hampshire document dated December 2019 and the Air Program Rules (Env-A).

Sanborn Head will use a refined air dispersion model, the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD), to estimate ambient air concentrations of regulated toxic air pollutants (RTAPs) fugitively emitted from the landfill resulting from waste decomposition.

Note that, while the landfill does not anticipate beginning landfilling operations until 2028, construction is anticipated to begin in 2025. Therefore, it is necessary for GSL to obtain a Temporary Air Permit prior to construction beginning in 2025.

2.0 SITE DESCRIPTION

The Granite State Landfill would be approximately 70.1 acres of a double-lined solid waste disposal facility located in Dalton, New Hampshire. The facility is planned to receive primarily mixed municipal solid waste (MSW) and construction and demolition (C&D) waste, along with Special Wastes and NHDES-Certified Waste Derived Products approved on a case-by-case basis (as defined by the Facility Operating Plan, to be submitted by GSL at a later date).

The GSL would be developed in one phase. A perimeter road and stormwater drainage systems are planned to be constructed around the facility. The anticipated capacity of the landfill is approximately 10.8 million cubic yards. Landfilling operations are anticipated to begin in 2028 and continue until 2046.

3.0 MODELING APPROACH

This Application is for the full buildout of the landfill. While GSL will have a landfill gas collection and control system (GCCS) in the future, this system will not be required until sometime after landfilling operations have begun and will not be included with the Application at this time. Therefore, the pollutants that will be included in the Application are those RTAPs that are anticipated to be emitted fugitively by the proposed landfill.

The Rules for RTAPs, Env-A 1405.01 (a) (1), states that an air dispersion modeling analysis may be used to demonstrate compliance with the AALs for RTAPs. Because the landfill is not yet constructed, GSL will provide a conceptual analysis to assess when a comprehensive GCCS will be required to demonstrate compliance with the Rules.

3.1 Fugitive LFG Flow Rates

LFG generation projections were estimated using U.S. Environmental Protection Agency's (USEPA's) Landfill Gas Emissions Model, Version 3.03 (LandGEM). For estimating fugitive RTAP emissions to input to the air dispersion model, we will assume that all the LFG generated will be emitted fugitively. See Appendix A for LFG generation estimates and a narrative.

3.2 Fugitive/Area Source Parameters

Refined air dispersion modeling will include RTAPs that will be emitted fugitively from the landfill surface. Details about the landfill source that are required for the modeling, such as the base elevation and average fugitive LFG release height are presented in Table 1. The landfill base elevation will be the average of the highest and lowest grade along the landfill footprint. We will use the average surface elevation from the landfill triangulated irregular network using Civil 3D 2021 Terrain Modeling Software by Autodesk for the fugitive LFG release elevation at full buildout of the landfill[1].

3.3 RTAP Averaging Periods and Emission Rates

Anticipated concentrations and emission rates for RTAPs in LFG are presented in Table 2. The air dispersion modeling will be performed to assess the ambient air impacts of the RTAPs over 24-hr and annual averaging periods based on the maximum amount of LFG projected to be generated and emitted fugitively from the landfill surface.

4.0 MODEL OPTIONS

AERMOD version 22112 simulations will be performed with regulatory default AERMOD options. The urban dispersion option (URBANOPT) will not be selected.

5.0 CLASS I AREA IMPACT ANALYSIS

Based on a letter dated February 14, 2005 from Mr. James Black of the NHDES-ARD to David Adams, P.E. of Sanborn Head, it is our understanding that when a source is not classified as a Prevention of Significant Deterioration (PSD) source for any pollutant, the impact on New Hampshire Class I areas need not be assessed. The landfill is not a PSD source of air pollutants.

6.0 METEOROLOGICAL DATA / AERMET

The meteorological data files required for modeling were provided by NHDES. For Whitefield, New Hampshire, the required meteorological data files are based on the National Weather Service Automated Surface Observing System in Whitefield, New Hampshire. The five-year meteorological data set is for the years 2017 through 2021.

---

[1] This method of determining average surface elevation provides results equivalent to the "surface area weighting scheme" previously used by Sanborn Head when modeling landfills in New Hampshire.

7.0 RECEPTORS

Pollutant concentrations will be modeled at receptor locations based on the air modeling guidance from NHDES. Receptors will be placed at 20-meter increments (or less) along the GSL property line, and in Cartesian grids with spacing as described in the following table.

Approximate Grid Spacing	**RTAPs**
20 meters	0 to 250 meters from GSL property line
250 meters	To 1,000 meters from GSL property line
500 meters	To 25,000 meters from GSL property line

Special purpose receptors are not included in the model.

8.0 TERRAIN DATA / AERMAP

Receptors, source locations, and buildings that are part of the air dispersion model are geo-referenced to the Universal Transverse Mercator (UTM) North American Datum of 1983 (NAD 83) Zone 19 (in units of meters).

8.1 Receptor Elevations

The AERMOD Terrain Pre-processor (AERMAP) will be used to produce XYZ coordinates and representative terrain-influence heights (hill height scale values) for modeling receptor locations. Terrain that is at or above a ten percent slope from every receptor will be required to calculate the hill height scale values. Four U.S. Geological Survey (USGS) 1/3-arc-second National Elevation Datasets (NEDs) (approximately 10-meter resolution) covering the modeling domain and significant terrain will be used as input to AERMAP. We will download four 1/3 arc-second USGS NEDs from the National Map website, each covering a 1-degree block:

- Title: USGS NED 1/3 arc-second n45w073 1 x 1 degree IMG 2018 (updated 2020)
- Title: USGS NED 1/3 arc-second n45w072 1 x 1 degree IMG 2019 (updated 2020)
- Title: USGS NED 1/3 arc-second n44w073 1 x 1 degree IMG 2018 (updated 2020)
- Title: USGS NED 1/3 arc-second n44w072 1 x 1 degree IMG 2022

We will then run the Terrain Files Converter to extract all terrain data and create elevation data files in GeoTiff format. We will then run AERMAP to determine elevations of receptors. Terrain data can be provided to NHDES upon request.

9.0 AMBIENT AIR LIMITS COMPARISON

RTAPs will be modeled by entering the emission rate of fugitive total RTAPs from the landfill. The highest first high concentration from the model for each averaging period will be proportioned to each contributing RTAP. The resulting proportioned RTAP ambient air concentrations will be compared to the applicable 24-hour and annual AALs.

10.0 AIR DISPERSION MODELING REPORT

Upon completion of the air dispersion modeling, Sanborn Head, on behalf of GSL, will prepare an Air Dispersion Modeling Report. The report will include electronic input and output AERMOD files and summary tables comparing model results to applicable AALs. If the conceptual air model demonstrates that one or more AALs will be exceeded at the emission rates shown in Table 2, we will provide a graph (fugitive flow rate [scfm] vs. RTAP concentration [ppm]) for each applicable RTAP that shows the threshold mass emission rate (g/sec) below which compliance with the AALs can be demonstrated. GSL understands that if estimated actual mass emission rates of the applicable RTAPs fall at or above their respective mass emission rate thresholds, at that time, NHDES will require that GSL install a GCCS to control fugitive RTAP emissions.

\\conserv1\shdata\4900s\4924.01\Source Files\Protocol\20230705 GSL Protocol Narrative.docx

Tables

TABLE 1
Fugitive/Area Source Parameters
Air Dispersion Modeling

Granite State Landfill
Dalton, New Hampshire

Unit	Landfill
Pollutants to be modeled	RTAPs
Base Elevation Low point (m)	352.33
Base Elevation Mid point (m)	383.42
Base Elevation High point (m)	414.51
Max Elevation at Full Buildout (m)	435.84
Average Elevation at Full Buildout (m)	405.16
Release Height (m)	21.74

Notes:
1. The shaded cells are model inputs.
2. Landfill elevations at full buildout are based on top of waste grades provided by CMA Engineers on March 22, 2023.
3. Release Height is the difference between the Average Elevation at Full Buildout and the Base Elevation Mid point.
4. The Average Elevation at Full Buildout of the landfill is estimated from the average surface elevation of the landfill triangulated irregular network using Civil 3D 2021 Terrain Modeling Software by Autodesk.

Table 2
Anticipated RTAPs Concentrations in LFG

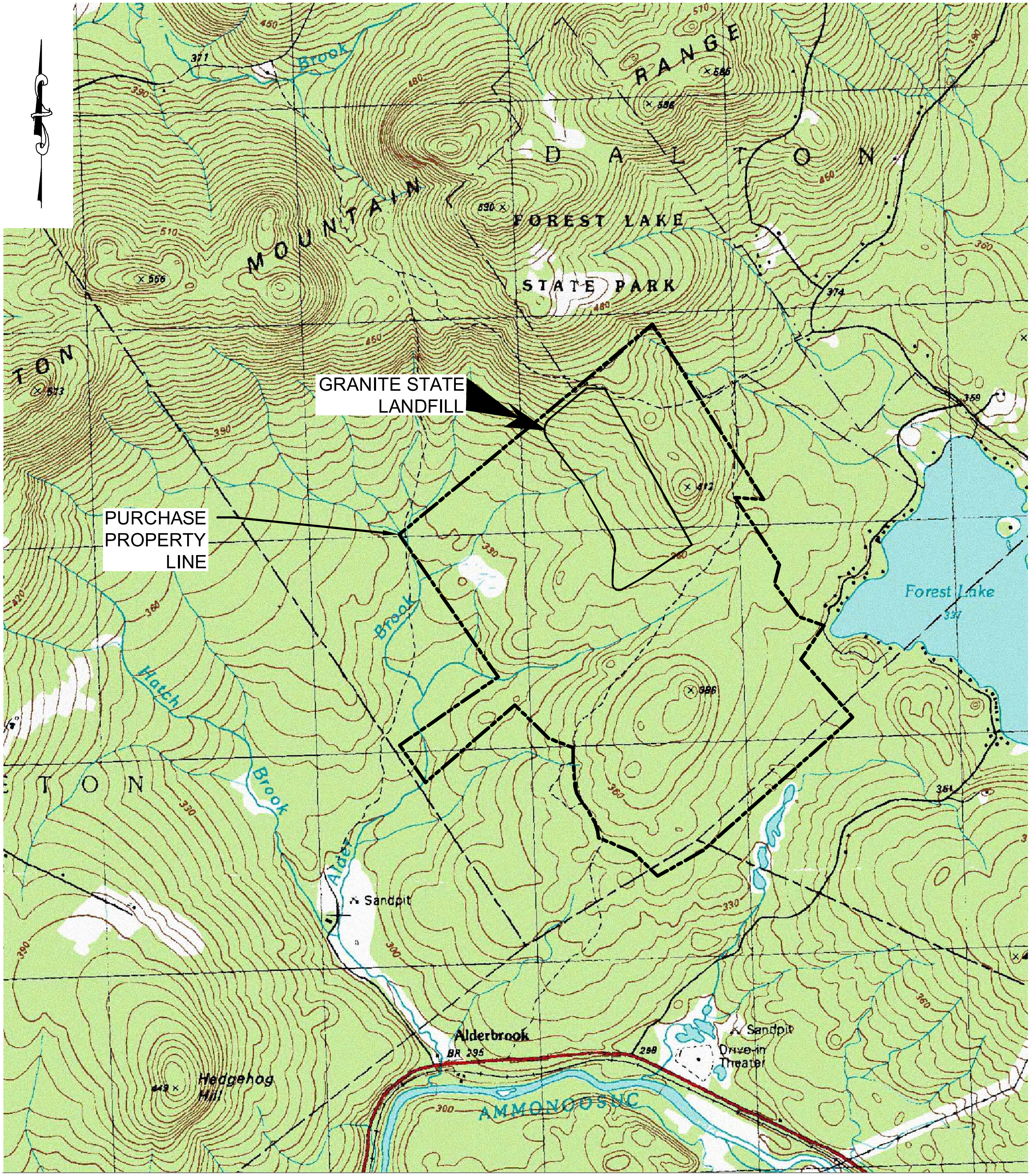
Granite State Landfill
Dalton, New Hampshire

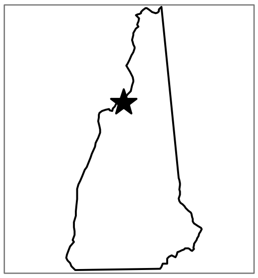
CAS Number	Pollutant	Molecular Weight	Concentration in Landfill (ppm-v)	Fugitive emissions (g/s)
	Hazardous Air Pollutants (HAPs) and Regulated Toxic Air Pollutants (RTAPs):			
71-55-6	1,1,1-Trichloroethane	133.41	0.48	0.0060
79-34-5	1,1,2,2-Tetrachloroethane	167.85	1.11	0.0175
75-34-3	1,1-Dichloroethane	98.97	2.35	0.0218
75-35-4	1,1-Dichloroethene	96.94	0.20	0.0018
107-06-2	1,2-Dichloroethane	98.96	0.41	0.0038
78-87-5	1,2-Dichloropropane	112.99	0.18	0.0019
107-13-1	Acrylonitrile	53.06	6.33	0.0315
71-43-2	Benzene	78.11	1.91	0.0140
75-15-0	Carbon disulfide	76.13	0.58	0.0041
56-23-5	Carbon tetrachloride	153.84	0.004	0.0001
463-58-1	Carbonyl sulfide	60.07	0.49	0.0028
108-90-7	Chlorobenzene	112.56	0.25	0.0026
75-00-3	Chloroethane	64.52	1.25	0.0076
67-66-3	Chloroform	119.39	0.03	0.0003
95-50-1	1,4 Dichlorobenzene	147.00	0.21	0.0029
75-09-2	Dichloromethane	84.94	14.3	0.1139
100-41-4	Ethylbenzene	106.16	4.61	0.0459
110-54-3	n-Hexane	86.18	6.57	0.0531
7439-97-6	Mercury	200.61	0.000292	0.00001
78-93-3	Methyl ethyl ketone	72.11	7.09	0.04796
108-10-1	Methyl isobutyl ketone	100.16	1.87	0.01757
127-18-4	Perchloroethylene	165.83	3.73	0.05803
108-88-3	Toluene	92.13	39.3	0.33966
79-01-6	Trichloroethylene	131.4	2.82	0.03476
75-01-4	Vinyl chloride	62.5	7.34	0.04304
1330-20-7	Xylenes	106.16	12.1	0.12050
--	Total HAPs	--	--	0.99
--	**Other Regulated Toxic Air Pollutants (RTAPs):**			
156-60-5	t-1,2-dichloroethene (trans-1,2-Dichloroethylene)	96.94	2.84	0.0258
67-64-1	Acetone	58.08	7.01	0.0382
75-45-6	Chlorodifluoromethane	86.47	1.3	0.0105
74-87-3	Chloromethane	50.49	1.21	0.0057
75-43-4	Dichlorofluoromethane	102.92	2.62	0.0253
624-92-0	Dimethyl Sulfide	62.13	7.820	0.0456
64-17-5	Ethanol	46.08	27.2	0.1176
106-93-4	Ethylene dibromide	187.88	0.001	0.0000
75-08-1	Ethyl mercaptan	62.13	2.28	0.0133
7783-06-4	Hydrogen sulfide	34.08	1,100	3.5168
74-93-1	Methyl mercaptan	48.11	2.49	0.0112
67-63-0	2-Propanol	60.11	50.1	0.2825
	Total RTAPs	--	--	5.086

Notes:
1. With the exception of hydrogen sulfide, RTAPs listed in the US EPA's Compilation of Pollutant Emission Factors (AP-42), Section 2.4, MSW Landfills (dated 11/98), Table 2.4-1 and Table 2.4-2, have been included in emissions estimate. Benzene and toluene data is listed in AP-42 Table 2.4-2.
2. The hydrogen sulfide concentration of 1,100 ppm is based on a conservative (high) estimate of Total Reduced Sulfur (TRS) concentration at NCES Landfill based on historic sampling results. This conservative (high) concentration at NCES Landfill will be used as a proxy for the future conservative (high) concentration at GSL until a point in time that samples can be collected from gas collection header piping at the GSL.
3. Fugitive emissions (g/s) are estimated based on the maximum volume of LFG anticipated to be emitted from the landfill surface at full buildout, 4,860 scfm.

Figures

File: P:\4900s\4924.01\Graphics Files\CAD\Air Modeling\AirMod_LocusPlan.dwg User: ewright Plot Date: 5-23-23 8:22 AM





Note:

Base Map USGS 7.5 minute topoquad Bethlehem W, New Hampshire dated 1998.

Drawn By: E. Wright
Designed By: M. Close
Reviewed By: H. Little
Project No: 4924.01
Date: May 2023

Feet
1,000' 0 2,000'

SANBORN HEAD

Figure 1

Locus Plan

Air Dispersion Modeling Protocol

Granite State Landfill, LLC
Dalton, New Hampshire

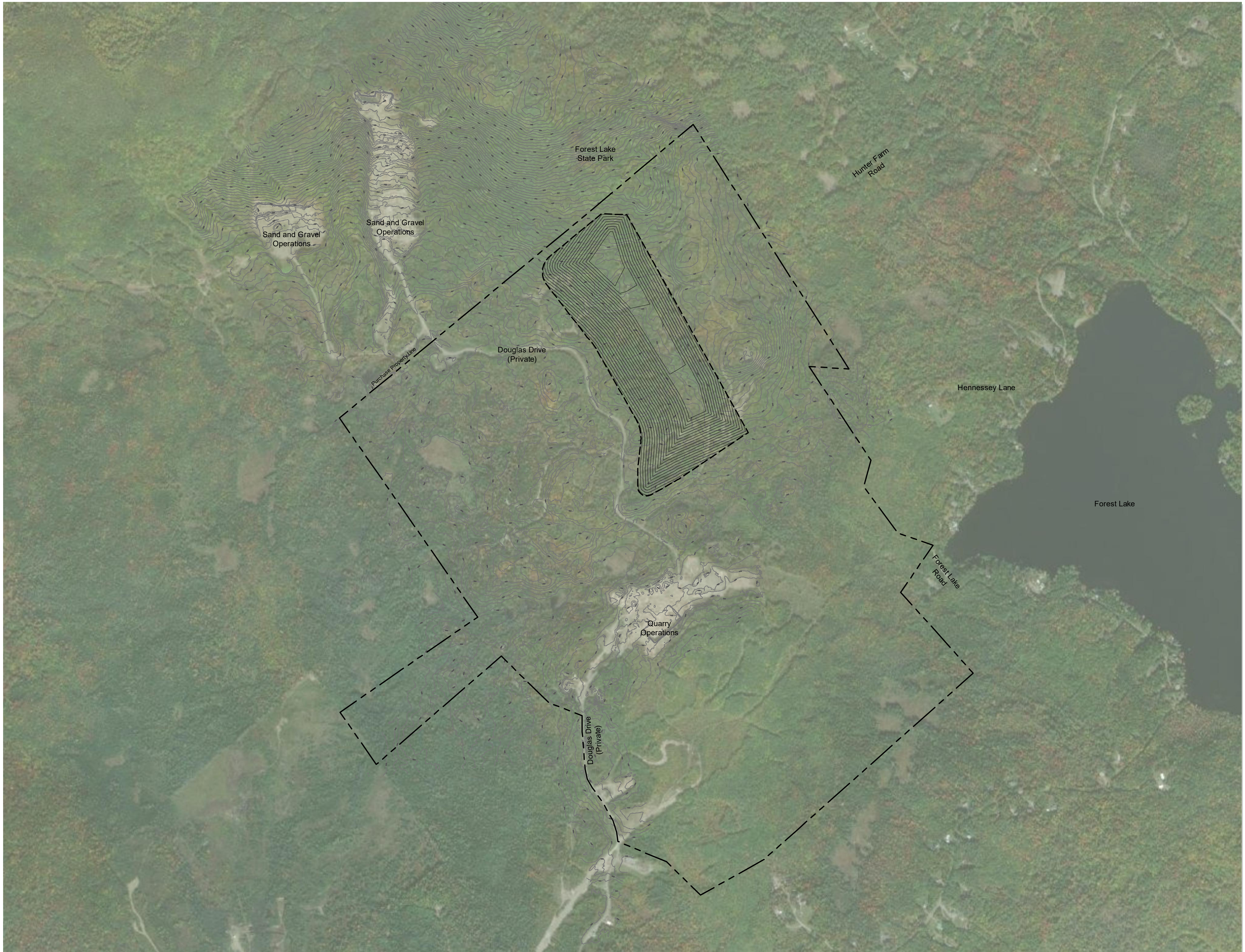


Figure 2

Site Plan

Air Dispersion Monitoring Protocol

Granite State Landfill LLC
Dalton, New Hampshire

Drawn By: E. Wright
Designed By: M. Close
Reviewed By: H. Little
Project No: 4924.01
Date: May 2023

Figure Narrative

This figure shows the approximate location of existing and proposed features in the vicinity of the site.

Notes

1. Ground surface topography provided by Horizons in January 2023.
2. Purchase property line provided by CMA in March 2023.
3. Proposed top of waste grades provided by CMA in March 2023.

Legend

- Purchase property line
- Ground surface topography
- Proposed 10 foot contour
- Proposed limit of waste

N W E S

500' 250' 0 500' 1,000' Feet

SANBORN HEAD

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Appendix A

Landfill Gas Generation Rate Projections

Appendix A
Landfill Gas Generation Rate Projections

To predict potential LFG generation rates, Sanborn Head used the U.S. Environmental Protection Agency's (USEPA's) Landfill Gas Emissions Model, Version 3.03 (LandGEM) with projected waste acceptance data.

Landfill gas generation rates were estimated using projected waste acceptance rates, AP-42 defaults for methane generation potential (L_0=100 m^3/Mg) and methane generation rate constant (k=0.04 yr^{-1}) and a multiplier of 1.7 based on fitting North Country Environmental Services' AP-42 gas collection rate curve to actual measured LFG collection rates. At this time, we believe this is the best estimate of landfill gas generation rates for the future GSL because the waste types will be the same, or similar to (on average) the waste types accepted at the NCES landfill and because environmental conditions are very similar between the two landfills.

The LandGEM projections indicate a peak LFG generation rate of 4,860 scfm occurring in the year 2046. The following tables include projected waste acceptance data used as input to the LandGEM model (Table A-1) and annual LFG generation rate estimates from LandGEM modeling (Table A-2).

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Table A-1
Waste Acceptance Rates

Granite State Landfill
Dalton, New Hampshire

Year	Total	
	Waste Acceptance Rate (Mg)	Waste Acceptance Rate (tons)
2028	413,676	456,000
2029	413,676	456,000
2030	413,676	456,000
2031	413,676	456,000
2032	413,676	456,000
2033	413,676	456,000
2034	413,676	456,000
2035	413,676	456,000
2036	413,676	456,000
2037	413,676	456,000
2038	413,676	456,000
2039	413,676	456,000
2040	413,676	456,000
2041	413,676	456,000
2042	413,676	456,000
2043	413,676	456,000
2044	413,676	456,000
2045	413,676	456,000
Total	**7,446,174**	**8,208,000**

Notes:
1. Megagrams (Mg) = tons x 0.907185
2. The projected annual waste acceptance rate for 2028 through 2045 is based on the GSL capacity of 10.8 x 10^6 cubic yards (cy), and a compaction density of 1,520 lb/cy, rounded to 0.76 tons/cy, to convert waste volume to mass. Information was provided by CMA Engineers on March 20, 2023.
3. The projected filling rate of 600,000 cubic yards (456,000 tons/year) was provided by CMA Engineers on March 20, 2023.

Table A-2
Landfill Gas Generation Rate Estimates from LandGEM Modeling

Granite State Landfill
Dalton, New Hampshire

	LandGEM Modeling with Lo=100 m^3/Mg, k=0.04/yr	
Year	Modeled LFG *Generation* Rate (scfm)	Modeled LFG *Generation* Rate x 1.7 multiplier (scfm)
2028	0	0
2029	218	371
2030	428	728
2031	630	1,071
2032	824	1,400
2033	1,010	1,716
2034	1,189	2,020
2035	1,360	2,313
2036	1,525	2,593
2037	1,684	2,863
2038	1,836	3,122
2039	1,983	3,371
2040	2,123	3,610
2041	2,259	3,840
2042	2,388	4,060
2043	2,513	4,272
2044	2,633	4,476
2045	2,748	4,672
2046	2,859	4,860
2047	2,747	4,669
2048	2,639	4,486
2049	2,536	4,310
2050	2,436	4,141
2051	2,341	3,979
2052	2,249	3,823
2053	2,161	3,673
2054	2,076	3,529
2055	1,995	3,391
2056	1,916	3,258
2057	1,841	3,130
2058	1,769	3,007
2059	1,700	2,889
2060	1,633	2,776
2061	1,569	2,667
2062	1,507	2,563
2063	1,448	2,462
2064	1,392	2,366
2065	1,337	2,273
2066	1,285	2,184
2067	1,234	2,098
2068	1,186	2,016
2069	1,139	1,937
2070	1,095	1,861
2071	1,052	1,788
2072	1,010	1,718
2073	971	1,650
2074	933	1,586
2075	896	1,524
2076	861	1,464
2077	827	1,406

Notes:

1. Landfill gas (LFG) generation rates were estimated with the USEPA's "Landfill Gas Emissions Model (LandGEM), Version 3.03," using projected waste acceptance rates, AP-42 defaults for methane generation potential (L_O=100 m^3/Mg) and methane generation rate constant (k=0.04 yr^{-1}) and a multiplier of 1.7 based on fitting NCES' AP-42 gas collection rate curve to actual measured LFG collection rates.

Appendix B

RTAP Emission Rate Sample Calculation

PURPOSE:

The purpose of these sample calculations is to present the methods used to estimate regulated toxic air pollutant (RTAP) emission rates for the Granite State Landfill (GSL) air dispersion modeling.

GIVEN:

- Molar Volume = 24.45 liter/mol at standard conditions (298 ° K, 760 mmHg)
- Predicted landfill gas (LFG) generation rate at full buildout (2046) at 50% CH_4 from GSL = 4,860 scfm

CALCULATION:

<u>RTAPs Fugitive Emissions</u>

Non methane organic compounds (NMOCs), volatile organic compounds (VOCs), and regulated toxic air pollutant (RTAP) emissions are based on concentrations of compounds in LFG. The approximate LFG fugitive emissions from the landfill surface are calculated assuming full buildout and no LFG collection.

A list of LFG constituents and respective concentrations is found in US EPA AP-42 Compilation of Air Emissions Factors. Hexane is used as an example.

- Concentration of Hexane found in LFG = 6.57 ppmv, AP-42
- Molecular weight of Hexane = 86.18 g/mol

Estimated Fugitive Hexane Emission Rate =

$$\frac{6.57 \text{ mol Hexane}}{10^6 \text{ mol LFG}} \times \frac{86.18 \text{ g Hexane}}{\text{mol Hexane}} \times \frac{\text{mol LFG}}{24.45 \text{ liter LFG}} \times \frac{28.317 \text{ liter LFG}}{\text{scf LFG}} \times \frac{4{,}860 \text{ scf}}{\text{min}} \times \frac{\text{min}}{60 \text{ sec}} = \frac{0.0531 \text{ g Hexane}}{\text{sec}}$$

This section of the form must be completed and signed by the Responsible Official on

17. CERTIFICATIONS	
☒	I certify that the applicant, or the owner or operator the applicant represents, has right, title, or interest in all of the property that is proposed for development or use because the owner or operator owns, leases, or has binding options to purchase all of the property proposed for development or use. I am authorized to make this submission on behalf of the affected source or affected units for which this submission is made. I certify under penalty of law that I have personally examined, and am familiar with, the information submitted in this document and all of its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false statements and information or omitting required statements and information, including the possibility of fine or imprisonment.

18. RESPONSIBLE OFFICIAL INFORMATION AND SIGNATURE	
RESPONSIBLE OFFICIAL NAME: John Gay, E.I.	
TITLE: Engineer	
J. Gay RESPONSIBLE OFFICIAL'S SIGNATURE	8/7/23 DATE:

SANBORN HEAD

Physical copy received:
August 11, 2023
ARD Permitting &
Environmental Health Bureau

Ms. Barbara Dorfschmidt
New Hampshire Department of Environmental Services
Air Resources Division
29 Hazen Drive, P.O. Box 95
Concord, New Hampshire 03302

August 10, 2023
File No. 4924.01

Re: Air Dispersion Modeling Report
Granite State Landfill, LLC.
Dalton, New Hampshire

Dear Barbara:

Sanborn, Head & Associates, Inc. (Sanborn Head) prepared the enclosed Air Dispersion Modeling Report on behalf of our client, Granite State Landfill, LLC (GSL) for the proposed landfill in Dalton, New Hampshire.

Please call Heather Little at 802-391-8506 if you have any questions.

Sincerely,
SANBORN, HEAD & ASSOCIATES, INC.

Meghan E. Close
Project Engineer

Heather H. Little, P.G.
Project Director

MEC/HHL: mec

Encl. Air Dispersion Modeling Report

cc: Joe Gay, GSL (electronic copy)
Kevin Roy, GSL (electronic copy)
David Healy, NHDES ARD (electronic copy)

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SANBORN HEAD

Air Dispersion Modeling Report

GRANITE STATE LANDFILL, LLC
Dalton, New Hampshire

Prepared for Granite State Landfill, LLC
File No. 4924.01
August 2023

TABLE OF CONTENTS

1.0 INTRODUCTION

On behalf of our client, Granite State Landfill, LLC (GSL), Sanborn, Head & Associates, Inc. (Sanborn Head) prepared this Air Dispersion Modeling Report (Report) for the proposed Granite State Landfill in Dalton, New Hampshire (landfill). This Report is being submitted to the New Hampshire Department of Environmental Services (NHDES) in support of the Temporary Permit Application (Application), which was submitted on July 5, 2023.

In New Hampshire, a Temporary Air Permit is required for specified categories of new or modified stationary sources of air pollutants prior to construction (Part Env-A 607 of the New Hampshire Code of Administrative Rules [Rules]). The landfill is subject to these requirements.

Air dispersion modeling is required because GSL is using the compliance demonstration method specified in Env-A 1405.02 to determine compliance with the ambient air limits (AALs). Air dispersion modeling was performed in general accordance with NHDES's Guidance and Procedure for Performing Air Quality Impact Modeling in New Hampshire document dated December 2019, the Air Dispersion Modeling Protocol submitted to NHDES as Appendix D of the July 5, 2023 Temporary Air Permit Application, and the Air Program Rules (Env-A).

Sanborn Head used a refined air dispersion model, the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD), to estimate ambient air concentrations of regulated toxic air pollutants (RTAPs) fugitively emitted from the landfill resulting from waste decomposition.

Note that, while the landfill does not anticipate beginning landfilling operations until 2028, construction is anticipated to begin in 2025. Therefore, it is necessary for GSL to obtain a Temporary Air Permit prior to construction beginning in 2025.

2.0 SITE DESCRIPTION

The Granite State Landfill would be approximately 70.1 acres of a double-lined solid waste disposal facility located in Dalton, New Hampshire. The facility is planned to receive primarily mixed municipal solid waste (MSW) and construction and demolition (C&D) waste, along with Special Wastes and NHDES-Certified Waste Derived Products approved on a case-by-case basis (as defined by the Facility Operating Plan, to be submitted by GSL at a later date).

The GSL would be developed in one phase. A perimeter road and stormwater drainage systems are planned to be constructed around the facility. The anticipated capacity of the landfill is approximately 10.8 million cubic yards. Landfilling operations are anticipated to begin in 2028 and continue until 2046.

3.0 MODELING APPROACH

The Application is for the full buildout of the landfill. While GSL will have a landfill gas collection and control system (GCCS) in the future, this system will not be required until sometime after landfilling operations have begun and were not included with the Application at the time. Therefore, the pollutants that were included in the Application are those RTAPs that are anticipated to be emitted fugitively by the proposed landfill.

The Rules for RTAPs, Env-A 1405.01 (a) (1), states that an air dispersion modeling analysis may be used to demonstrate compliance with the AALs for RTAPs. Because the landfill is not yet constructed, GSL will provide a conceptual analysis to assess when a comprehensive GCCS will be required to demonstrate compliance with the Rules.

3.1 Fugitive LFG Flow Rates

LFG generation projections were estimated using U.S. Environmental Protection Agency's (USEPA's) Landfill Gas Emissions Model, Version 3.03 (LandGEM). For estimating fugitive RTAP emissions to input to the air dispersion model, we assumed that all the LFG generated will be emitted fugitively. See Appendix A for LFG generation estimates and a narrative.

3.2 Fugitive/Area Source Parameters

Refined air dispersion modeling included RTAPs that will be emitted fugitively from the landfill surface. Details about the landfill source that were required for the modeling, such as the base elevation and average fugitive LFG release height are presented in Table 1. The landfill base elevation was the average of the highest and lowest grade along the landfill footprint. We used the average surface elevation from the landfill triangulated irregular network using Civil 3D 2021 Terrain Modeling Software by Autodesk for the fugitive LFG release elevation at full buildout of the landfill[1].

3.3 RTAP Averaging Periods and Emission Rates

Anticipated concentrations and emission rates for RTAPs in LFG are presented in Table 2. The air dispersion modeling was performed to assess the ambient air impacts of the RTAPs over 24-hr and annual averaging periods based on the maximum amount of LFG projected to be generated and emitted fugitively from the landfill surface. Sample emission rates calculations are included in Appendix B.

4.0 MODEL OPTIONS

AERMOD version 22112 simulations were performed with regulatory default AERMOD options. The urban dispersion option (URBANOPT) was not selected.

5.0 CLASS I AREA IMPACT ANALYSIS

Based on a letter dated February 14, 2005 from Mr. James Black of the NHDES-ARD to David Adams, P.E. of Sanborn Head, it is our understanding that when a source is not classified as a Prevention of Significant Deterioration (PSD) source for any pollutant, the impact on New Hampshire Class I areas need not be assessed. The landfill is not a PSD source of air pollutants.

6.0 METEOROLOGICAL DATA / AERMET

The meteorological data files required for modeling were provided by NHDES. For Whitefield, New Hampshire, the required meteorological data files are based on the National Weather

[1] This method of determining average surface elevation provides results equivalent to the "surface area weighting scheme" previously used by Sanborn Head when modeling landfills in New Hampshire.

Service Automated Surface Observing System in Whitefield, New Hampshire. The five-year meteorological data set is for the years 2017 through 2021.

7.0 RECEPTORS

Pollutant concentrations were modeled at receptor locations based on the air modeling guidance from NHDES. Receptors were placed at 20-meter increments (or less) along the GSL property line, and in Cartesian grids with spacing as described in the following table.

Approximate Grid Spacing	RTAPs
20 meters	0 to 250 meters from GSL property line
250 meters	To 1,000 meters from GSL property line
500 meters	To 25,000 meters from GSL property line

Special purpose receptors are not included in the model.

8.0 TERRAIN DATA / AERMAP

Receptors, source locations, and buildings that are part of the air dispersion model are geo-referenced to the Universal Transverse Mercator (UTM) North American Datum of 1983 (NAD 83) Zone 19 (in units of meters).

8.1 Receptor Elevations

The AERMOD Terrain Pre-processor (AERMAP) was used to produce XYZ coordinates and representative terrain-influence heights (hill height scale values) for modeling receptor locations. Terrain that is at or above a ten percent slope from every receptor was required to calculate the hill height scale values. Four U.S. Geological Survey (USGS) 1/3-arc-second National Elevation Datasets (NEDs) (approximately 10-meter resolution) covering the modeling domain and significant terrain were used as input to AERMAP. We downloaded four 1/3 arc-second USGS NEDs from the National Map website, each covering a 1-degree block:

- Title: USGS NED 1/3 arc-second n45w073 1 x 1 degree IMG 2018 (updated 2020)
- Title: USGS NED 1/3 arc-second n45w072 1 x 1 degree IMG 2019 (updated 2020)
- Title: USGS NED 1/3 arc-second n44w073 1 x 1 degree IMG 2018 (updated 2020)
- Title: USGS NED 1/3 arc-second n44w072 1 x 1 degree IMG 2022

We then ran the Terrain Files Converter to extract all terrain data and create elevation data files in GeoTiff format. We then ran AERMAP to determine elevations of receptors. Terrain data is included in Appendix C.

9.0 AMBIENT AIR LIMITS COMPARISON

RTAPs were modeled by entering the emission rate of fugitive total RTAPs from the landfill to AERMOD. Air dispersion modeling input and output files are available for download (see Appendix C). Raw air dispersion modeling results are available in Appendix D. The highest first high concentration from the model for each averaging period was proportioned to each contributing RTAP. The resulting proportioned RTAP ambient air concentrations were compared to the applicable 24-hour and annual AALs.

With the exception of Hydrogen Sulfide (H_2S) and Trichloroethylene (TCE), compliance with the applicable 24-hour and annual AALs has been demonstrated for each RTAP modeled (see Tables 2 through 4). The figures below (fugitive flow rate [scfm] vs. H_2S concentration [ppm] [Figure A] and fugitive flow rate [scfm] vs. TCE concentration [ppm] [Figure B]) show the threshold mass emission rate (0.135 g/sec for H_2S and 0.0229 g/s for TCE) below which compliance with the respective AALs can be demonstrated. GSL understands that if the estimated actual mass emission rate for either H_2S and/or TCE falls at or above the respective threshold mass emission rates of 0.135 g/s for H_2S or 0.0229 g/s for TCE, at that time, NHDES may require that GSL install a GCCS to control fugitive RTAP emissions or determine another mechanism to demonstrate compliance.

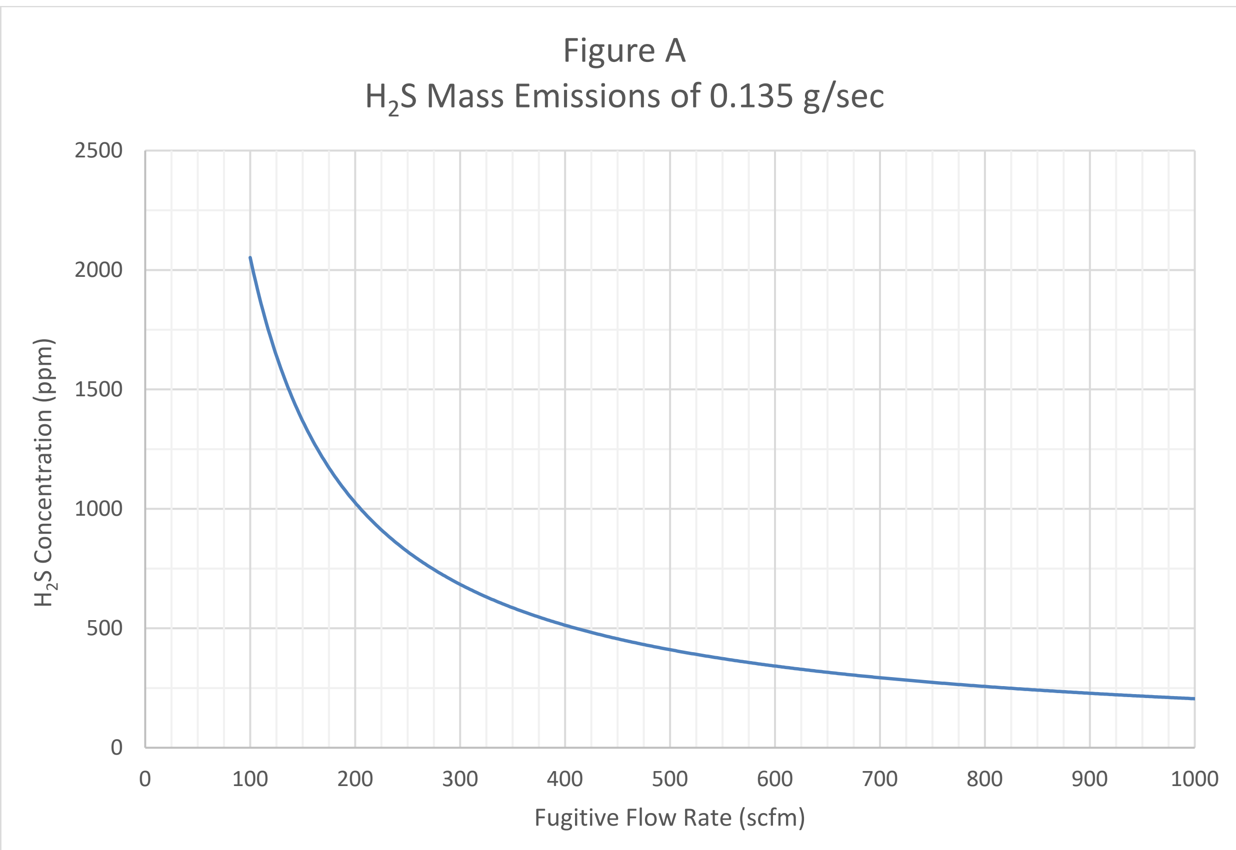

Figure A. H_2S mass loading that results in 0.135 g/s emissions, below which compliance with the H_2S AALs can be demonstrated.

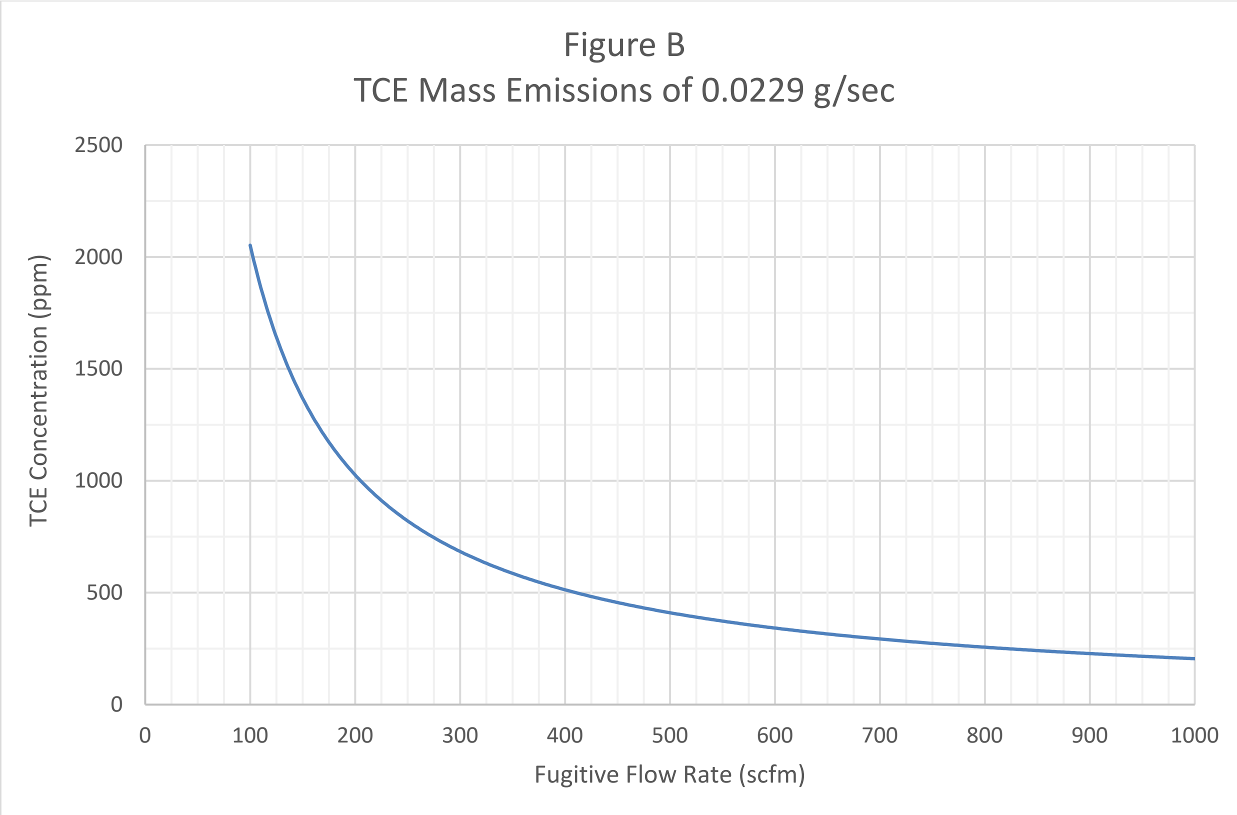

Figure B. TCE mass loading that results in 0.0229 g/s emissions, below which compliance with the TCE AALs can be demonstrated.

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Tables

TABLE 1
Fugitive/Area Source Parameters
Air Dispersion Modeling

Granite State Landfill
Dalton, New Hampshire

Unit	Landfill
Pollutants to be modeled	RTAPs
Base Elevation Low point (m)	352.33
Base Elevation Mid point (m)	383.42
Base Elevation High point (m)	414.51
Max Elevation at Full Buildout (m)	438.28
Average Elevation at Full Buildout (m)	405.78
Release Height (m)	22.36

Notes:
1. The shaded cells are model inputs.
2. Landfill elevations at full buildout are based on top of waste grades provided by CMA Engineers on July 14, 2023.
3. Release Height is the difference between the Average Elevation at Full Buildout and the Base Elevation Mid point.
4. The Average Elevation at Full Buildout of the landfill is estimated from the average surface elevation of the landfill triangulated irregular network using Civil 3D 2021 Terrain Modeling Software by Autodesk.

TABLE 2
Anticipated RTAPs Concentrations in LFG
Air Dispersion Modeling

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463-58-1	Carbonyl sulfide	60.07	0.49	0.0028
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75-00-3	Chloroethane	64.52	1.25	0.0076
67-66-3	Chloroform	119.39	0.03	0.0003
95-50-1	1,4 Dichlorobenzene	147.00	0.21	0.0029
75-09-2	Dichloromethane	84.94	14.3	0.1139
100-41-4	Ethylbenzene	106.16	4.61	0.0459
110-54-3	n-Hexane	86.18	6.57	0.0531
7439-97-6	Mercury	200.61	0.000292	0.00001
78-93-3	Methyl ethyl ketone	72.11	7.09	0.04796
108-10-1	Methyl isobutyl ketone	100.16	1.87	0.01757
127-18-4	Perchloroethylene	165.83	3.73	0.05803
108-88-3	Toluene	92.13	39.3	0.33966
79-01-6	Trichloroethylene	131.4	2.82	0.03476
75-01-4	Vinyl chloride	62.5	7.34	0.04304
1330-20-7	Xylenes	106.16	12.1	0.12050
--	Total HAPs	--	--	0.99
--	**Other Regulated Toxic Air Pollutants (RTAPs):**			
156-60-5	t-1,2-dichloroethene (trans-1,2-Dichloroethylene)	96.94	2.84	0.0258
67-64-1	Acetone	58.08	7.01	0.0382
75-45-6	Chlorodifluoromethane	86.47	1.3	0.0105
74-87-3	Chloromethane	50.49	1.21	0.0057
75-43-4	Dichlorofluoromethane	102.92	2.62	0.0253
624-92-0	Dimethyl Sulfide	62.13	7.820	0.0456
64-17-5	Ethanol	46.08	27.2	0.1176
106-93-4	Ethylene dibromide	187.88	0.001	0.0000
75-08-1	Ethyl mercaptan	62.13	2.28	0.0133
7783-06-4	Hydrogen sulfide	34.08	1,100	3.5168
74-93-1	Methyl mercaptan	48.11	2.49	0.0112
67-63-0	2-Propanol	60.11	50.1	0.2825
	Total RTAPs	--	--	5.086

Notes:

1. With the exception of hydrogen sulfide, RTAPs listed in the US EPA's Compilation of Pollutant Emission Factors (AP-42), Section 2.4, MSW Landfills (dated 11/98), Table 2.4-1 and Table 2.4-2, have been included in emissions estimate. Benzene and toluene data is listed in AP-42 Table 2.4-2.
2. The hydrogen sulfide concentration of 1,100 ppm is based on a conservative (high) estimate of Total Reduced Sulfur (TRS) concentration at NCES Landfill based on historic sampling results. This conservative (high) concentration at NCES Landfill will be used as a proxy for the future conservative (high) concentration at GSL until a point in time that samples can be collected from gas collection header piping at the GSL.
3. Fugitive emissions (g/s) are estimated based on the maximum volume of LFG anticipated to be emitted from the landfill surface at full buildout, 4,860 scfm.

TABLE 3
Regulated Toxic Air Pollutant Air Dispersion Modeling Results
Air Dispersion Modeling

Granite State Landfill
Dalton, New Hampshire

Scenario A-1: Highest 1st high 24-hr RTAP impact	443.60	ug/m^3
Scenario A-1: Highest 1st high annual RTAP impact	75.00	ug/m^3

		24-Hour and Annual Averaging Periods		24-Hour Averaging Period			Annual Averaging Period		
Z	Hazardous Air Pollutants (HAPs) Regulated Toxic Air Pollutants (RTAPs):	Fugitive ER (g/s)	Portion of Total(%)	Predicted 24-hr Impact (ug/m^3)	24-hr AAL (ug/m^3)	Pass? (Yes/No)	Predicted Annual Impact (ug/m^3)	Annual AAL (ug/m^3)	Pass? (Yes/No)
71-55-6	1,1,1-Trichloroethane (methyl chloroform)	0.006	0.118	0.524	6,821	Yes	0.089	5,000	Yes
79-34-5	1,1,2,2-Tetrachloroethane	0.017	0.344	1.524	25	Yes	0.258	16	Yes
75-34-3	1,1-Dichloroethane	0.022	0.429	1.903	2,037	Yes	0.322	1,358	Yes
75-35-4	1,1-Dichloroethene (vinylidene chloride)	0.002	0.036	0.159	200	Yes	0.027	200	Yes
107-06-2	1,2-Dichloroethane (ethylene dichloride)	0.004	0.075	0.332	143	Yes	0.056	95	Yes
78-87-5	1,2-Dichloropropane (propylene dichloride)	0.002	0.038	0.166	232	Yes	0.028	4.0	Yes
107-13-1	Acrylonitrile	0.032	0.620	2.748	15	Yes	0.465	2.0	Yes
71-43-2	Benzene	0.014	0.275	1.221	5.7	Yes	0.206	3.8	Yes
75-15-0	Carbon disulfide	0.004	0.081	0.361	700	Yes	0.061	700	Yes
56-23-5	Carbon tetrachloride	0.000	0.001	0.0050	T	Yes	0.001	100	Yes
463-58-1	Carbonyl sulfide	0.003	0.054	0.241	87	Yes	0.041	41	Yes
108-90-7	Chlorobenzene	0.003	0.052	0.230	231	Yes	0.039	154	Yes
75-00-3	Chloroethane (ethyl chloride)	0.008	0.149	0.660	10,000	Yes	0.112	10,000	Yes
67-66-3	Chloroform	0.000	0.007	0.029	175	Yes	0.005	117	Yes
95-50-1	1,4 Dichlorobenzene	0.003	0.057	0.253	536	Yes	0.043	357	Yes
75-09-2	Dichloromethane (methylene chloride)	0.114	2.240	9.939	621	Yes	1.680	600	Yes
100-41-4	Ethylbenzene	0.046	0.903	4.004	1,000	Yes	0.677	1,000	Yes
110-54-3	n-Hexane	0.053	1.044	4.633	885	Yes	0.783	700	Yes
7439-97-6	Mercury	0.000	0.000	0.0005	0.30	Yes	0.000	0.30	Yes
78-93-3	Methyl ethyl ketone	0.048	0.943	4.183	5,000	Yes	0.707	5,000	Yes
108-10-1	Methyl isobutyl ketone	0.018	0.345	1.533	3,000	Yes	0.259	3,000	Yes
127-18-4	Perchloroethylene	0.058	1.141	5.061	607	Yes	0.856	40	Yes
108-88-3	Toluene	0.340	6.679	29.626	5,000	Yes	5.009	5,000	Yes
79-01-6	Trichloroethylene	0.035	0.683	3.032	2	No	0.513	2	Yes
75-01-4	Vinyl chloride	0.043	0.846	3.754	9.3	Yes	0.635	6.2	Yes
1330-20-7	Xylenes	0.121	2.37	10.511	1,550	Yes	1.777	100	Yes
Total HAPs		0.993	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Other Regulated Toxic Air Pollutants (RTAPs):									
156-60-5	t-1,2-dichloroethene (trans-1,2-Dichloroethylene)	0.026	0.508	2.253	3,989	Yes	0.381	2,659	Yes
67-64-1	Acetone	0.038	0.751	3.331	2,120	Yes	0.563	1,413	Yes
75-45-6	Chlorodifluoromethane	0.011	0.207	0.920	50,000	Yes	0.156	50,000	Yes
74-87-3	Chloromethane (methyl chloride)	0.006	0.113	0.500	368	Yes	0.085	245	Yes
75-43-4	Dichlorofluoromethane	0.025	0.497	2.206	211	Yes	0.373	141	Yes
624-92-0	Dimethyl sulfide (methyl sulfide)	0.046	0.896	3.975	9.7	Yes	0.672	6.5	Yes
64-17-5	Ethanol	0.118	2.31	10.256	6,714	Yes	1.734	4,476	Yes
106-93-4	Ethylene dibromide	0.000	0.0003	0.0015	0.050	Yes	0.000	0.050	Yes
75-08-1	Ethyl mercaptan	0.013	0.261	1.159	9.2	Yes	0.196	4.4	Yes
7783-06-4	Hydrogen sulfide	3.517	69.149	306.740	50	No	51.865	2.0	No
74-93-1	Methyl mercaptan	0.011	0.221	0.980	4.9	Yes	0.166	3.3	Yes
67-63-0	2-Propanol	0.283	5.55	24.64	1,757	Yes	4.166	1,171	Yes
Total RTAPs		5.086	100	443.6	N/A	N/A	75.00	N/A	N/A

Notes:
1. ER = Emission rate in grams per second (g/sec)
2. 24-hour and annual ambient air limits (AALs) are from Table 1450-1 of Chapter Env-A-1400 of the New Hampshire Code of Administrative Rules

TABLE 4
Hydrogen Sulfide Air Dispersion Modeling Results
Air Dispersion Modeling

Granite State Landfill
Dalton, New Hampshire

Scenario A-1: Highest 1st high 24-hr H2S impact	11.8	ug/m^3
Scenario A-1: Highest 1st high annual H2S impact	1.99	ug/m^3

			24-Hour Averaging Period			Annual Averaging Period		
CAS Number	**Regulated Toxic Air Pollutants (RTAPs):**	**Fugitive ER (g/s)**	**Predicted Impact (ug/m3)**	**24-hr AAL (ug/m3)**	**Pass? (Yes/No)**	**Predicted Impact (ug/m3)**	**Annual AAL (ug/m3)**	**Pass? (Yes/No)**
7783-06-4	Hydrogen sulfide	0.135	11.77	50	Yes	1.99	2.0	Yes

Notes:
1. 24-hour and annual ambient air limits (AALs) are from Table 1450-1 of Chapter Env-A-1400 of the New Hampshire Code of Administrative Rules.
2. The H_2S emission rate of 0.135 g/s is the threshold mass emission rate below which compliance with the AALs can be demonstrated. Figure A shows the fugitive flow rate and H_2S concentration combinations that meet this threshold.

TABLE 5
Trichloroethylene Air Dispersion Modeling Results
Air Dispersion Modeling

Granite State Landfill
Dalton, New Hampshire

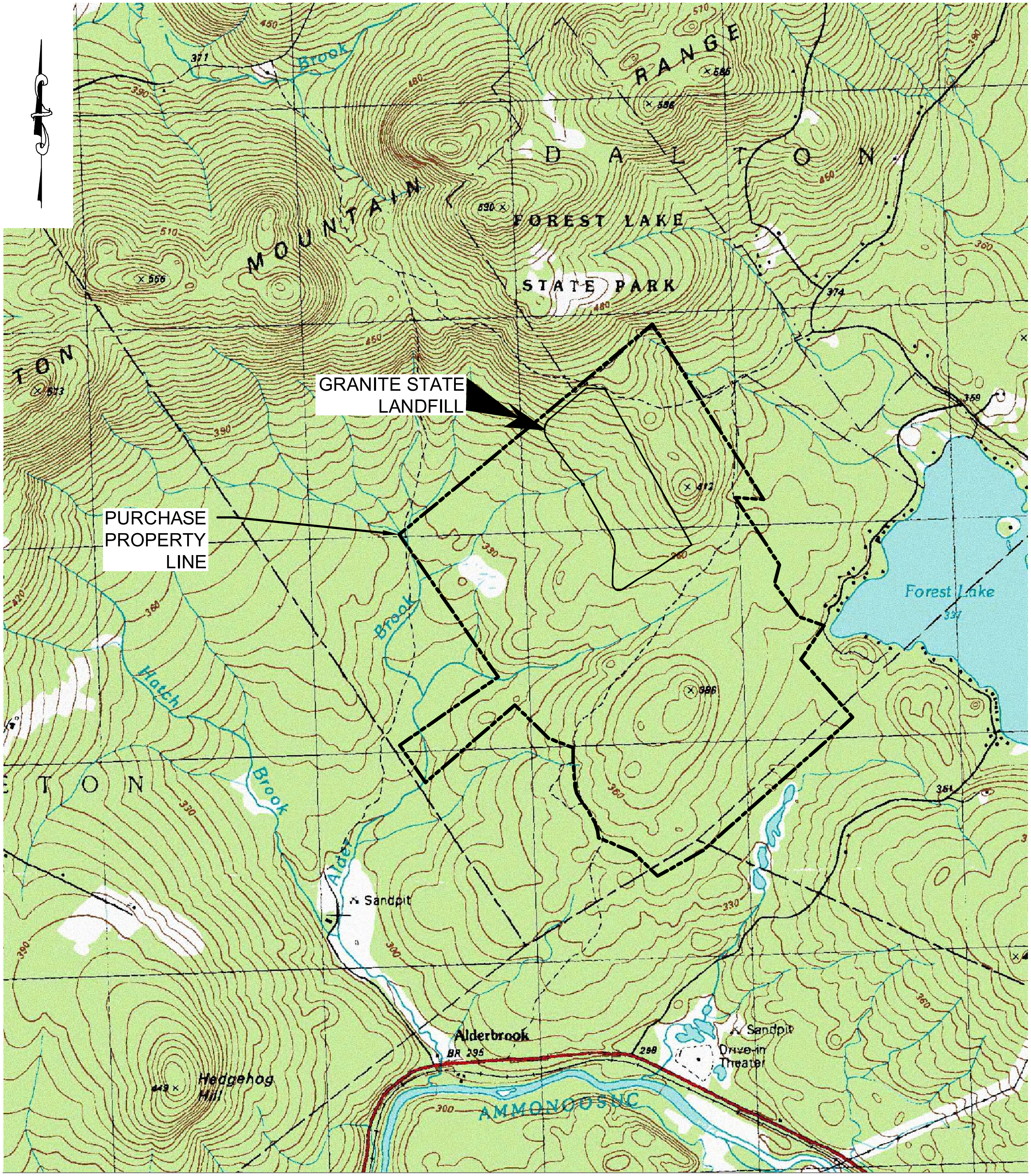
Scenario A-1: Highest 1st high 24-hr Trichloroethylene impact	1.997	ug/m^3
Scenario A-1: Highest 1st high annual Trichloroethylene impact	0.34	ug/m^3

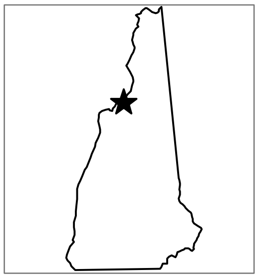
			24-Hour Averaging Period			Annual Averaging Period		
CAS Number	**Regulated Toxic Air Pollutants (RTAPs):**	**Fugitive ER (g/s)**	**Predicted Impact (ug/m3)**	**24-hr AAL (ug/m3)**	**Pass? (Yes/No)**	**Predicted Impact (ug/m3)**	**Annual AAL (ug/m3)**	**Pass? (Yes/No)**
79-01-6	Trichloroethylene	0.023	1.997	2.0	Yes	0.34	2.0	Yes

Notes:
1. 24-hour and annual ambient air limits (AALs) are from Table 1450-1 of Chapter Env-A-1400 of the New Hampshire Code of Administrative Rules.
2. The Trichloroethylene emission rate of 0.023 g/s is the threshold mass emission rate below which compliance with the AALs can be demonstrated. Figure A shows the fugitive flow rate and Trichloroethylene concentration combinations that meet this threshold.

Figures

File: P:\4900s\4924.01\Graphics Files\CAD\Air Modeling\AirMod_LocusPlan.dwg User: ewright Plot Date: 8-8-23 12:22 PM





Note:

Base Map USGS 7.5 minute topoquad Bethlehem W, New Hampshire dated 1998.

Drawn By: E. Wright
Designed By: M. Close
Reviewed By: H. Little
Project No: 4924.01
Date: August 2023

Feet
1,000' 0 2,000'

SANBORN | HEAD

Figure 1

Locus Plan

Air Dispersion Modeling Protocol

Granite State Landfill, LLC
Dalton, New Hampshire

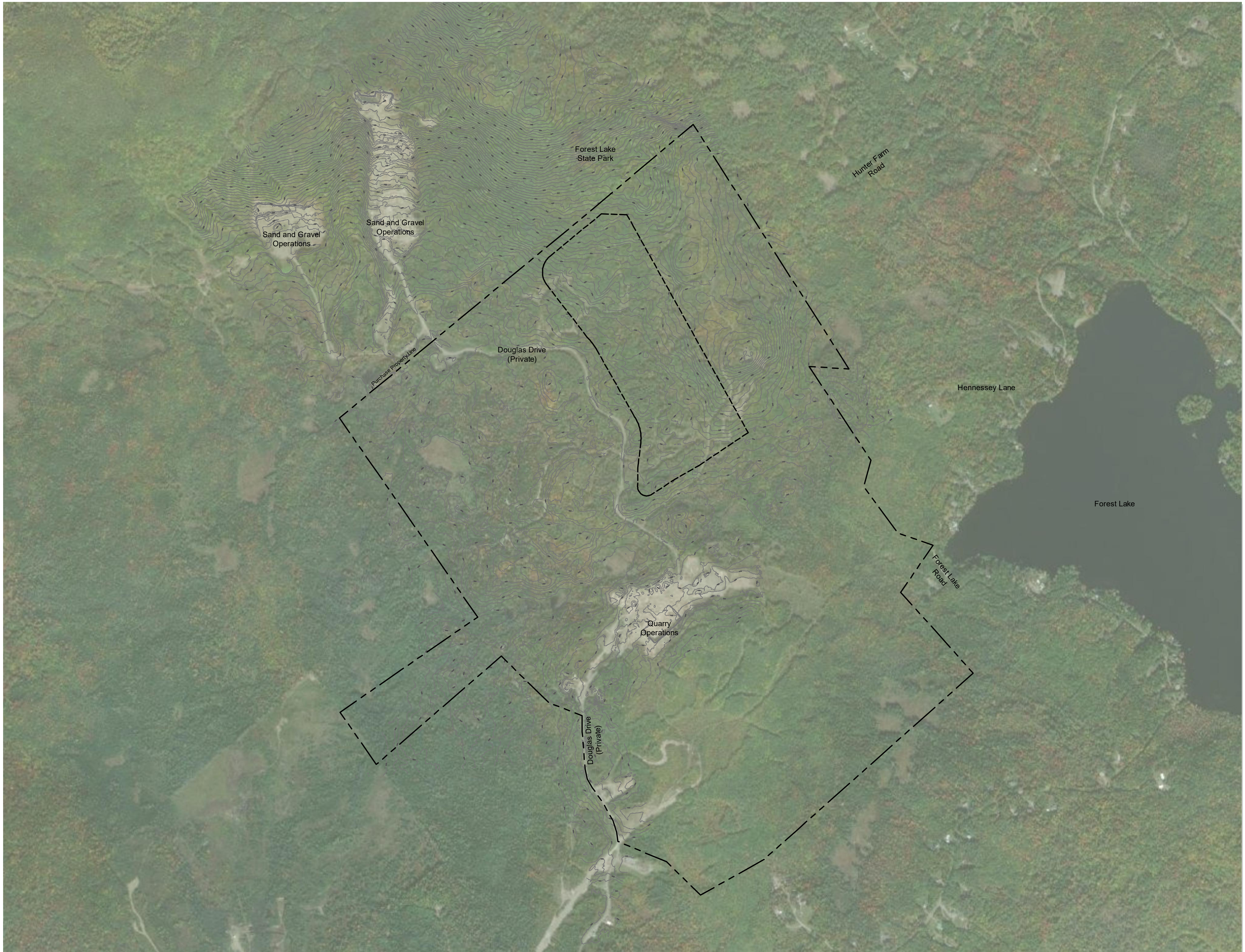


Figure 2

Site Plan

Air Dispersion Monitoring Protocol

Granite State Landfill LLC
Dalton, New Hampshire

Drawn By: E. Wright
Designed By: M. Close
Reviewed By: H. Little
Project No: 4924.01
Date: August 2023

Figure Narrative

This figure shows the approximate location of existing and proposed features in the vicinity of the site.

Notes

1. Ground surface topography provided by Horizons in January 2023.

2. Purchase property line provided by CMA in March 2023.

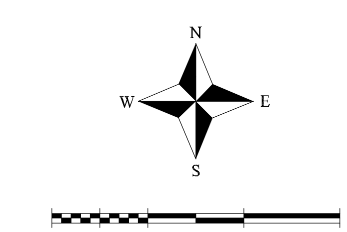
3. Proposed limit of waste provided by CMA in July 2023.

Legend

- - - - Purchase property line

Ground surface topography

- - - - - - Proposed limit of waste



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Appendix A

Landfill Gas Generation Rate Projections

Appendix A
Landfill Gas Generation Rate Projections

To predict potential LFG generation rates, Sanborn Head used the U.S. Environmental Protection Agency's (USEPA's) Landfill Gas Emissions Model, Version 3.03 (LandGEM) with projected waste acceptance data.

Landfill gas generation rates were estimated using projected waste acceptance rates, AP-42 defaults for methane generation potential (L_0=100 m^3/Mg) and methane generation rate constant (k=0.04 yr^{-1}) and a multiplier of 1.7 based on fitting North Country Environmental Services' AP-42 gas collection rate curve to actual measured LFG collection rates. At this time, we believe this is the best estimate of landfill gas generation rates for the future GSL because the waste types will be the same, or similar to (on average) the waste types accepted at the NCES landfill and because environmental conditions are very similar between the two landfills.

The LandGEM projections indicate a peak LFG generation rate of 4,860 scfm occurring in the year 2046. The following tables include projected waste acceptance data used as input to the LandGEM model (Table A-1) and annual LFG generation rate estimates from LandGEM modeling (Table A-2).

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Table A-1
Waste Acceptance Rates

Granite State Landfill
Dalton, New Hampshire

Year	Total	
	Waste Acceptance Rate (Mg)	Waste Acceptance Rate (tons)
2028	413,676	456,000
2029	413,676	456,000
2030	413,676	456,000
2031	413,676	456,000
2032	413,676	456,000
2033	413,676	456,000
2034	413,676	456,000
2035	413,676	456,000
2036	413,676	456,000
2037	413,676	456,000
2038	413,676	456,000
2039	413,676	456,000
2040	413,676	456,000
2041	413,676	456,000
2042	413,676	456,000
2043	413,676	456,000
2044	413,676	456,000
2045	413,676	456,000
Total	**7,446,174**	**8,208,000**

Notes:
1. Megagrams (Mg) = tons x 0.907185
2. The projected annual waste acceptance rate for 2028 through 2045 is based on the GSL capacity of 10.8 x 10^6 cubic yards (cy), and a compaction density of 1,520 lb/cy, rounded to 0.76 tons/cy, to convert waste volume to mass. Information was provided by CMA Engineers on March 20, 2023.
3. The projected filling rate of 600,000 cubic yards (456,000 tons/year) was provided by CMA Engineers on March 20, 2023.

Table A-2
Landfill Gas Generation Rate Estimates from LandGEM Modeling

Granite State Landfill
Dalton, New Hampshire

	LandGEM Modeling with Lo=100 m^3/Mg, k=0.04/yr	
Year	Modeled LFG *Generation* Rate (scfm)	Modeled LFG *Generation* Rate x 1.7 multiplier (scfm)
2028	0	0
2029	218	371
2030	428	728
2031	630	1,071
2032	824	1,400
2033	1,010	1,716
2034	1,189	2,020
2035	1,360	2,313
2036	1,525	2,593
2037	1,684	2,863
2038	1,836	3,122
2039	1,983	3,371
2040	2,123	3,610
2041	2,259	3,840
2042	2,388	4,060
2043	2,513	4,272
2044	2,633	4,476
2045	2,748	4,672
2046	2,859	4,860
2047	2,747	4,669
2048	2,639	4,486
2049	2,536	4,310
2050	2,436	4,141
2051	2,341	3,979
2052	2,249	3,823
2053	2,161	3,673
2054	2,076	3,529
2055	1,995	3,391
2056	1,916	3,258
2057	1,841	3,130
2058	1,769	3,007
2059	1,700	2,889
2060	1,633	2,776
2061	1,569	2,667
2062	1,507	2,563
2063	1,448	2,462
2064	1,392	2,366
2065	1,337	2,273
2066	1,285	2,184
2067	1,234	2,098
2068	1,186	2,016
2069	1,139	1,937
2070	1,095	1,861
2071	1,052	1,788
2072	1,010	1,718
2073	971	1,650
2074	933	1,586
2075	896	1,524
2076	861	1,464
2077	827	1,406

Notes:

1. Landfill gas (LFG) generation rates were estimated with the USEPA's "Landfill Gas Emissions Model (LandGEM), Version 3.03," using projected waste acceptance rates, AP-42 defaults for methane generation potential (L_O=100 m^3/Mg) and methane generation rate constant (k=0.04 yr^{-1}) and a multiplier of 1.7 based on fitting NCES' AP-42 gas collection rate curve to actual measured LFG collection rates.

Appendix B

RTAP Emission Rate Sample Calculation

PURPOSE:

The purpose of these sample calculations is to present the methods used to estimate regulated toxic air pollutant (RTAP) emission rates for the Granite State Landfill (GSL) air dispersion modeling.

GIVEN:

- Molar Volume = 24.45 liter/mol at standard conditions (298 ° K, 760 mmHg)
- Predicted landfill gas (LFG) generation rate at full buildout (2046) at 50% CH_4 from GSL = 4,860 scfm

CALCULATION:

RTAPs Fugitive Emissions

Non methane organic compounds (NMOCs), volatile organic compounds (VOCs), and regulated toxic air pollutant (RTAP) emissions are based on concentrations of compounds in LFG. The approximate LFG fugitive emissions from the landfill surface are calculated assuming full buildout and no LFG collection.

A list of LFG constituents and respective concentrations is found in US EPA AP-42 Compilation of Air Emissions Factors. Hexane is used as an example.

- Concentration of Hexane found in LFG = 6.57 ppmv, AP-42
- Molecular weight of Hexane = 86.18 g/mol

Estimated Fugitive Hexane Emission Rate =

$$\frac{6.57\text{ mol Hexane}}{10^6\text{ mol LFG}} \times \frac{86.18\text{ g Hexane}}{\text{mol Hexane}} \times \frac{\text{mol LFG}}{24.45\text{ liter LFG}} \times \frac{28.317\text{ liter LFG}}{\text{scf LFG}} \times \frac{4{,}860\text{ scf}}{\text{min}} \times \frac{\text{min}}{60\text{ sec}} = \frac{0.0531\text{ g Hexane}}{\text{sec}}$$

Appendix C

Air Dispersion Modeling Input and Output Files

(Uploaded to Sharefile for transmission to NHDES - https://sanbornhead.sharefile.com/d-s5008a130ab9f415aaa57d9335f6b53ab)

Appendix D

Raw Air Dispersion Modeling Results

Raw Air Dispersion Modeling Results: Regulated Toxic Air Pollutants
Air Dispersion Modeling

Granite State Landfill
Dalton, New Hampshire

Model	File	Pollutant	Average	Group	Rank	Conc/Dep	East (X)	North (Y)	Elev	Hill	Flag	Time	Met File	Sources	Groups	Receptors
AERMOD 22112	GSL RTAP_2018_RTAP_1.SUM	RTAP	24-HR	ALL	1ST	443.59564	285239	4914836	405.11	590.28	0	18011624	Whitefield_2018_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL RTAP_2020_RTAP_1.SUM	RTAP	24-HR	ALL	1ST	382.09508	285239	4914836	405.11	590.28	0	20121824	Whitefield_2020_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL RTAP_2019_RTAP_1.SUM	RTAP	24-HR	ALL	1ST	380.90067	285210	4914850	405.59	590.28	0	19072524	Whitefield_2019_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL RTAP_2021_RTAP_1.SUM	RTAP	24-HR	ALL	1ST	291.51508	285239	4914836	405.11	590.28	0	21011024	Whitefield_2021_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL RTAP_2017_RTAP_1.SUM	RTAP	24-HR	ALL	1ST	229.05589	285239	4914836	405.11	590.28	0	17032024	Whitefield_2017_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL RTAP_2020_RTAP_1.SUM	RTAP	ANNUAL	ALL	1ST	75.00474	285239	4914836	405.11	590.28	0	1 YEARS	Whitefield_2020_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL RTAP_2019_RTAP_1.SUM	RTAP	ANNUAL	ALL	1ST	69.1011	285239	4914836	405.11	590.28	0	1 YEARS	Whitefield_2019_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL RTAP_2021_RTAP_1.SUM	RTAP	ANNUAL	ALL	1ST	63.39958	285239	4914836	405.11	590.28	0	1 YEARS	Whitefield_2021_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL RTAP_2018_RTAP_1.SUM	RTAP	ANNUAL	ALL	1ST	62.24596	285239	4914836	405.11	590.28	0	1 YEARS	Whitefield_2018_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL RTAP_2017_RTAP_1.SUM	RTAP	ANNUAL	ALL	1ST	50.15212	285239	4914836	405.11	590.28	0	1 YEARS	Whitefield_2017_22112_v1.SFC	1	1	14626

Raw Air Dispersion Modeling Results: Hydrogen Sulfide
Air Dispersion Modeling

Granite State Landfill
Dalton, New Hampshire

Model	File	Pollutant	Average	Group	Rank	Conc/Dep	East (X)	North (Y)	Elev	Hill	Flag	Time	Met File	Sources	Groups	Receptors
AERMOD 22112	GSL H2S_2018_H2S.SUM	H2S	24-HR	ALL	1ST	11.77456	285239	4914836	405.11	590.28	0	18011624	Whitefield_2018_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL H2S_2020_H2S.SUM	H2S	24-HR	ALL	1ST	10.14212	285239	4914836	405.11	590.28	0	20121824	Whitefield_2020_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL H2S_2019_H2S.SUM	H2S	24-HR	ALL	1ST	10.11042	285210	4914850	405.59	590.28	0	19072524	Whitefield_2019_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL H2S_2021_H2S.SUM	H2S	24-HR	ALL	1ST	7.73782	285239	4914836	405.11	590.28	0	21011024	Whitefield_2021_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL H2S_2017_H2S.SUM	H2S	24-HR	ALL	1ST	6.07993	285239	4914836	405.11	590.28	0	17032024	Whitefield_2017_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL H2S_2020_H2S.SUM	H2S	ANNUAL	ALL	1ST	1.99088	285239	4914836	405.11	590.28	0	1 YEARS	Whitefield_2020_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL H2S_2019_H2S.SUM	H2S	ANNUAL	ALL	1ST	1.83418	285239	4914836	405.11	590.28	0	1 YEARS	Whitefield_2019_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL H2S_2021_H2S.SUM	H2S	ANNUAL	ALL	1ST	1.68284	285239	4914836	405.11	590.28	0	1 YEARS	Whitefield_2021_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL H2S_2018_H2S.SUM	H2S	ANNUAL	ALL	1ST	1.65222	285239	4914836	405.11	590.28	0	1 YEARS	Whitefield_2018_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL H2S_2017_H2S.SUM	H2S	ANNUAL	ALL	1ST	1.33121	285239	4914836	405.11	590.28	0	1 YEARS	Whitefield_2017_22112_v1.SFC	1	1	14626

Raw Air Dispersion Modeling Results: Trichloroethylene
Air Dispersion Modeling

Granite State Landfill
Dalton, New Hampshire

Model	File	Pollutant	Average	Group	Rank	Conc/Dep	East (X)	North (Y)	Elev	Hill	Flag	Time	Met File	Sources	Groups	Receptors
AERMOD 22112	GSL TCE_2018_TCE.SUM	TCE	24-HR	ALL	1ST	1.99731	285239	4914836	405.11	590.28	0	18011624	Whitefield_2018_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL TCE_2020_TCE.SUM	TCE	24-HR	ALL	1ST	1.7204	285239	4914836	405.11	590.28	0	20121824	Whitefield_2020_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL TCE_2019_TCE.SUM	TCE	24-HR	ALL	1ST	1.71503	285210	4914850	405.59	590.28	0	19072524	Whitefield_2019_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL TCE_2021_TCE.SUM	TCE	24-HR	ALL	1ST	1.31256	285239	4914836	405.11	590.28	0	21011024	Whitefield_2021_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL TCE_2017_TCE.SUM	TCE	24-HR	ALL	1ST	1.03134	285239	4914836	405.11	590.28	0	17032024	Whitefield_2017_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL TCE_2020_TCE.SUM	TCE	ANNUAL	ALL	1ST	0.33771	285239	4914836	405.11	590.28	0	1 YEARS	Whitefield_2020_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL TCE_2019_TCE.SUM	TCE	ANNUAL	ALL	1ST	0.31113	285239	4914836	405.11	590.28	0	1 YEARS	Whitefield_2019_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL TCE_2021_TCE.SUM	TCE	ANNUAL	ALL	1ST	0.28546	285239	4914836	405.11	590.28	0	1 YEARS	Whitefield_2021_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL TCE_2018_TCE.SUM	TCE	ANNUAL	ALL	1ST	0.28027	285239	4914836	405.11	590.28	0	1 YEARS	Whitefield_2018_22112_v1.SFC	1	1	14626
AERMOD 22112	GSL TCE_2017_TCE.SUM	TCE	ANNUAL	ALL	1ST	0.22581	285239	4914836	405.11	590.28	0	1 YEARS	Whitefield_2017_22112_v1.SFC	1	1	14626